EXTRAORDINARY ANIMALS WORLDWIDE

Karl P N Shuker

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KARL P. N. SHUKER
Foreword by Janet & Colin Bord

Scientific analysis is brought to bear on these true tales of mysterious birds, beasts and fish. Dr Karl P. N. Shuker investigates a fascinating assortment of little-known and bizarre creatures, illustrating his account with nineteenth-century engravings from his personal collection.

By tenacious research in obscure journals, books, and foreign publications, the author has unearthed absorbing details of the appearance, behaviour and habitat of numerous creatures that continue to perplex the zoological community. They include such remarkable fauna as the giant mystery 'ape' of South America (featured on the back cover); the extraordinary singing dog of New Guinea; venomous snakes with cockscombs; and the gigantic flesh-eating terror birds that replaced the extinct carnivorous dinosaurs.

Beautiful antiquarian prints appear throughout the text, faithfully recording these 'monsters' of the natural world. These are real creatures that offer daunting challenges to the orthodox scientist in search of satisfactory explanations.

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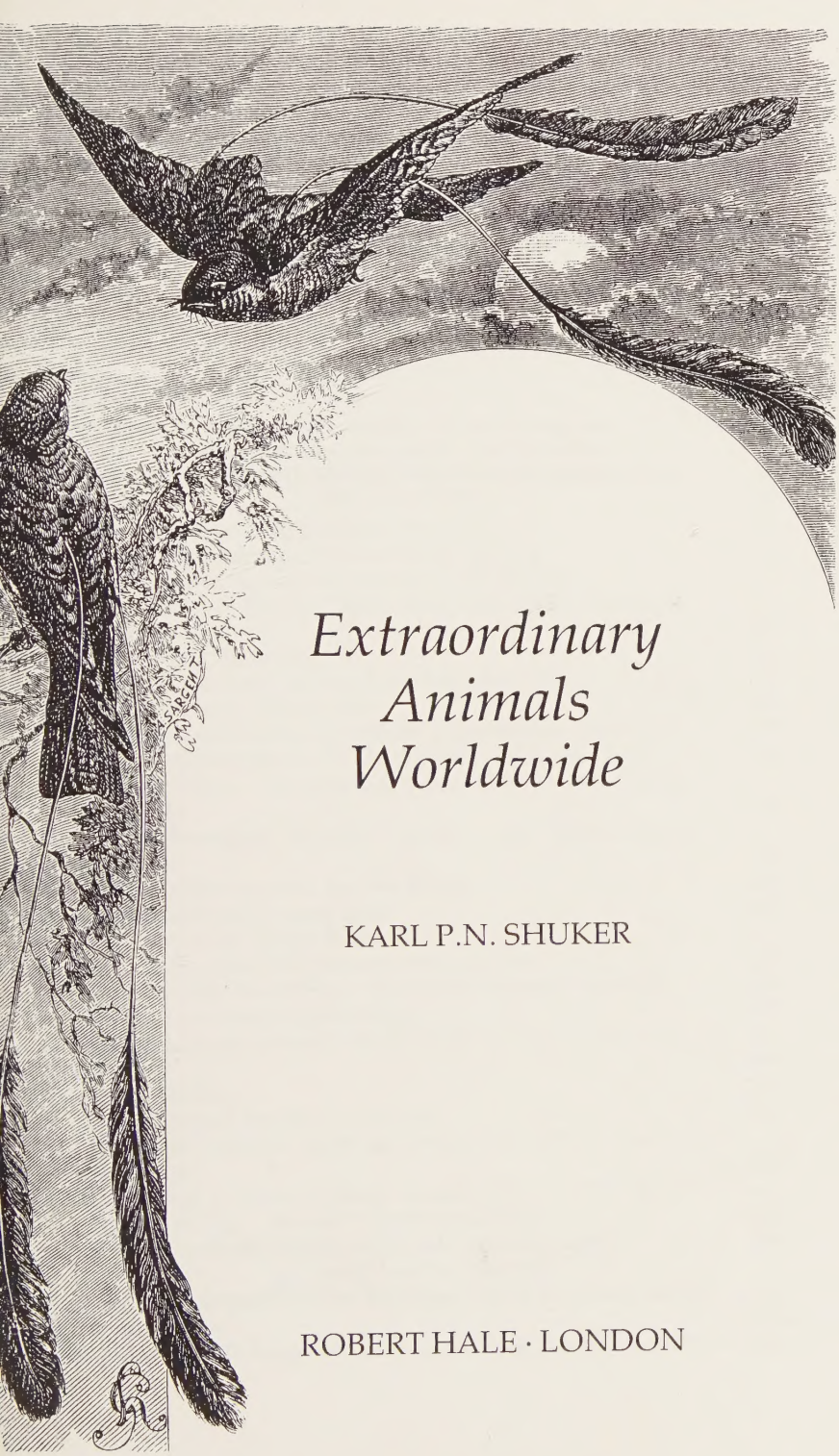
Ameranthropoides loysi – *South America's mystery 'ape'*
(Photo: Fortean Picture Library)



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KARL P.N. SHUKER

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To my mother, Mary D. Shuker, whose lifelong interest in wildlife has guided and encouraged my own since my earliest days.

The mother's heart is the child's schoolroom.

Henry Ward Beecher, *Life Thoughts*

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Foreword

by Janet and Colin Bord

Living in the country, as we are fortunate enough to do, surrounded by trees and with river valleys, mountains and forests close by, one soon becomes accustomed to natural events that once, when we first moved to this house, were new and exciting. The tawny owls, for instance, which live in our conifer plantation, and every year produce young which can be seen perching on the gate-posts or sitting side by side on a tree gazing down like Tweedledum and Tweedledee. Or the curlews, which every year return to the valley, their haunting calls echoing up the hillside. The arrival in early May of the house martins, without whose restless flight and endless chatter the summer would be dull indeed. (We disregard the marks on our windows and white walls – they are a small price to pay for our enjoyment of the birds' exuberant love of life.)

No doubt much goes on here that we do not know about. Going out on a winter's morning into the snow-covered garden, we see footprints everywhere, indicating that while we were asleep all kinds of animals have been active: if only our cats could talk! We see rabbits, of course, and sometimes hares; we see stoats and weasels, rats, mice, voles, moles and shrews. Pheasants are commonplace, feeding in our garden throughout the winter, and often a female will reward us come the spring by nesting on the ground, in a clump of daffodils by the front window for example. But the eggs never hatch: either she deserts the nest when there is activity in the garden, as we begin to repair the winter ravages; or the nest is discovered by a cat which wastes no time in breaking open the eggs and eating the contents.

It would be easy, if we didn't have to earn a living, to spend the whole of our days outdoors: apart from the work to be done, there is so much wildlife to discover and to watch. In addition to the larger creatures there are of course also many species of insect. In summer we become aware of the wasps building their nests in the tool-shed; of the bees who have taken up residence inside the house wall, entering through a hole by the bathroom window, with their constant toing and froing during the warm weather; of the many different kinds of spider and flies, beetles and caterpillars.

But although we see all these birds and beasts regularly, we know

very little about them. We observe their behaviour, but we are seeing only a small fragment of their lives; and when we read up on any creature, be it spiders or bats, we cannot help but be amazed by the intricacy of their existence. Humankind is by nature egocentric, seeing all other forms of life as subordinate and of incidental importance, but as a species we will need to learn humility and tolerance if we are to survive on earth. Above all we will have to learn to live in easy harmony with all other forms of nature, not constantly trying to subdue them. We are never keen to admit our dependence on the natural world, but we are a part of it and the sooner we come to terms with that fact and begin to treat nature sympathetically, the better it will be for everyone. We can begin by reawakening our awareness of the myriad life-forms with which we share the planet, and there is no better guide to the more extraordinary manifestations of nature than Dr Shuker. His forays into the backwaters of zoology have resulted in this collection of case-studies which will fascinate even the most experienced student of the natural world, and will cause us all to look at the world around us with a new sense of wonder.

Introduction

> Indeed, what is there that does not appear marvellous when it comes to our knowledge for the first time? How many things, too, are looked upon as quite impossible until they have been actually effected?
>
> Pliny the Elder, *Natural History, Book VII*

The above quotation is never more valid than when applied to the animal kingdom, and provides the theme of this entire book – because this book does *not* deal with commonplace creatures, or with familiar facets of animal behaviour or lifestyle. On the contrary, its subjects are ones that have stimulated wonder and curiosity, mystery and mythology, and, in many cases, surprising new discoveries and continuing controversy.

Drawing its material from a diverse array of sources – from forgotten treatises, obscure journals, and foreign-language accounts not previously made available in English, to the most recent scientific researches and media reports – and brought together for the very first time in a single volume, this is an investigation of some of the most extraordinary animals and astonishing episodes from the annals of unnatural history. An introduction to such creatures as the blue rhinoceros, and the flying jackal; a 'terrible mouse' the size of a fox terrier, and a voracious, horse-eating terror bird taller than the ostrich; a mystery 'ape' of South America, and a giant Himalayan lungfish(?); Australia's electric platypus, and Africa's amazing lightning bird; a snake that not only bears a cockscomb but also crows like a cockerel, and another that miaows like a cat; a 40-ton 'earth shaker', and a 70-ft sea monster; the Father of Stenches, and the Whale-Headed King; the bird with two beaks, and the bird with four wings; a gliding frog, and a parachuting palm civet; the devil-pig, and the devil-bird; a New Guinea phoenix, and a yodelling dingo; serpent-kings, and snake-stone secrets; a pygmy tyrannosaur, and a giant bee; the squeaking deathshead ... and many more.

In order to complement these animals' unusual nature with equally arresting illustrations, I have, whenever possible, drawn extensively upon what must surely be one of the most attractive artforms ever devised – the exquisite art of wood-engraving, sadly eclipsed by the advent of photography and largely forgotten today by all but its most avowed aficionados. Some of the engravings included in this book originally appeared in one or more of the following antiquarian wildlife works:

Brown, R. (ed.), *Our Earth and Its Story*, 3 vols (Cassell, 1887-9)
Duncan, P.M. (ed.), *Cassell's Natural History*, 6 vols (Cassell, 1883-9)
Figuier, L., *The Insect World* (Cassell, 1872)
Gesner, C., *Historiae Animalium, Liber 1 ...* (*apud* Christ. Froschoverum, Tiguri, 1551)
Lydekker, R. (ed.), *The Royal Natural History*, 6 vols (Frederick Warne, 1894-6)
Newton, A., and Gadow, H., *A Dictionary of Birds* (Adam and Charles Black, 1896)
Pouchet, F.A., *The Universe* (Blackie and Son, 1873)
Taffs, A. (ed.), *The World of Wonders* (Cassell, Petter, and Galpin, 1881)
Tennent, E., *Sketches of the Natural History of Ceylon* (Longman, Green, Longman, and Roberts, 1861)
Wood, J.G., *Illustrated Natural History*, 3 vols (Routledge, Warne, and Routledge, 1859-63)

This, then, is a book of extraordinary animals. However, lest anyone should despair of ever encountering such creatures personally (fearing that they must surely inhabit only the most remote reaches of the world, and that they all, by definition, must have strange forms, or bizarre histories) permit me to present without further ado this book's first example. For it provides an excellent demonstration that some truly extraordinary animals live in the most familiar of lands and are perfectly ordinary creatures – until, without warning, they reveal a totally unexpected facet of their nature.

The setting was the famous Exmoor wildlife sanctuary of noted naturalist Trevor Beer, one day in June 1988. Walking towards some ground-level vegetation, Trevor suddenly heard a series of very shrill cries, which seemed to be coming from the vegetation. Peering closely, Trevor spotted a stoat *Mustela erminea*, sitting on its hind legs and staring up at him. Mindful of the very wary nature of stoats, which will disappear from view at the slightest movement made by anyone fortunate enough to spy one of these handsome animals, Trevor paused, pleased to be able to observe it at such close range, but nonetheless expecting it to vanish at any moment.

The stoat did not vanish, however; instead, it remained sitting upright for a time, and then dropped on all fours, but immediately rose back up onto its haunches again, repeating the shrill cries that had first drawn Trevor's attention to it. And still it made no attempt to leave. Naturally, Trevor was quite perplexed by this very atypical behaviour for a species widely considered to be one of Britain's most elusive mammals. At first he wondered whether it might have some young hiding nearby, and was standing guard to ensure that he did not harm them, but then, as he recalled to me when recounting this most interesting episode afterwards, some indefinable instinct told him that it was important that he should take an even closer look nonetheless.

So he bent down towards the stoat, and it continued to stare at him, but still did not move away. And as he peered at it, Trevor suddenly noticed a thorn from a hawthorn bush embedded in one of the animal's

forepaws. Considering the relatively large size of the thorn in proportion to the tiny size of the stoat's paw, there could be little doubt that it was inflicting a great deal of pain upon the unfortunate animal. Clearly, then, there was only one course of action open, so Trevor reached out towards the stoat in an attempt to pick it up and see whether he could pull the thorn out. Not too surprisingly, the stoat reacted by snapping at his hand, but eventually, with a balance of patience and speed, Trevor succeeded in gently catching hold of it. He was able to pull the thorn out quickly and easily, after which he placed the stoat back on the ground.

Even then the stoat did not run away. First of all it sniffed tentatively at its treated paw, and then licked it several times, no doubt to ease the pain and reassure itself that all was well with it once more. Only then did it finally turn around, and disappear amongst the nearby trees.

To this day, Trevor is sure that the stoat had been 'asking' him for his help, and in view of its unexpectedly fearless behaviour and overall attitude, who could disagree? Having said that, it is very fortunate that Trevor was the human to whom the stoat appealed; there are all too many who would have dealt with the unfortunate animal in a much less kindly manner. Trevor, however, is someone who has not only a great knowledge of his fellow creatures but also a great compassion and respect for them. Perhaps this is why the stoat made its presence known to him in this remarkable, Androclesian incident; as Shakespeare noted in *Coriolanus*, 'Nature teaches beasts to know their friends.'

There are many other thoroughly remarkable creatures awaiting attention and investigation in the following twenty-four chapters of this book. So venture now, if you will, into this menagerie of the marvellous and mysterious, to encounter creatures of reality and legend, to meet inhabitants of dreams and, occasionally, of nightmares – an assemblage of fascinating and, above all else, truly extraordinary animals. Or, to borrow from the Bard of Stratford-upon-Avon once again,

> I would entreat thy company
> To see the wonders of the world.
>
> William Shakespeare, *Two Gentlemen of Verona*

1 *Ameranthropoides – The Strange Saga of a South American 'Ape'*

Simia, quam similis turpissuma bestia, nobis!
[The ape, vilest of beasts, how simliar to us!]
Ennius, *Cicero – de Natura Deorum, Book I*

One of the twentieth century's most controversial zoological events was the alleged discovery of an unknown species of ape in South America, an enigmatic episode that remains a unique, unresolved anomaly in the annals of zoology.

From 1917 to 1920, Swiss geologist Dr François de Loys and a team of colleagues had been conducting a scientific expedition through a little-explored forest-covered range of mountains called the Sierra de Perijáa, straddling the Colombia-Venezuela border. It proved to be a forbidding, inhospitable region, with the hapless party beset by virulent tropical diseases, threatened by all manner of venomous fauna, and perpetually in fear of the highly hostile Motilone Indians with their deadly poison-tipped arrows. So harrowing were their experiences that by 1920 most members of the expedition were dead; upon his return to civilization later that year, a gaunt, haggard Dr de Loys was accompanied by less than a handful of the original twenty-strong team.

Even then, however, their ordeal was far from over. Before the close of the 1920s, the expedition, and de Loys in particular, would be accused by many of perpetrating a deliberate, elaborate hoax – and all because of one very remarkable photograph.

According to an article by de Loys (*Illustrated London News*, 15 June 1929), in 1920 his party had been exploring the untrodden forests along the Tarra River, a tributary of the Rio Catatumbo in the Motilones regions of Colombia and Venezuela. Suddenly, near a bend in one of the Tarra's own, western tributaries, two strange creatures strode into view just ahead, resembling tall, hairy, tailless apes walking on their hind legs.

Approaching the party, they became increasingly violent, screaming wildly and ripping branches and foliage off nearby vegetation in anger. As a further gesture of their barely contained fury, they even defecated into their hands and threw their excrement at the explorers – who by then were not only astonished at the sight of such totally unfamiliar creatures, but were also thoroughly alarmed, fearing for their own

Spider monkeys – identity of Ameranthropoides?

safety. Consequently, when what seemed to be the male member of the pair, leading its mate towards them, drew even closer, de Loys and party opened fire at it with their guns. Just as they did so, however, the male moved to one side, in order for his mate to approach alongside him. As a result, he escaped the majority of the shots, which hit the female instead, killing her instantly – whereupon the male turned and fled.

The female's body was closely examined by the explorers, who were all completely mystified by its singular appearance. So they sat it upright on a packing case, kept it erect by propping it up with a long stick placed underneath its chin, carefully measured it, and photographed it from the front (but *not* from the back – a critical component of this saga). According to de Loys, most of the photographs were tragically lost a little later, when their boat capsized in a river, but at least one superb photograph was saved – see frontispiece.

The measurements recorded by de Loys, and the surviving photograph, bear witness to a truly extraordinary creature. Fundamentally, it was most similar to the *Ateles* spider monkeys, possessing a number of features characterizing these familiar South American primates. For example: each of its eyes was encircled by a prominent ridge of bone; its genital organs were very large; its thumbs were extremely small; its hands and feet were shaped like those of spider monkeys; the triangular patch of pale pigment on its forehead compared closely with that of the long-haired spider monkey *Ateles belzebuth* (a species itself known from the Rio Tarra valley); and, like *all* New World primates, not just spider monkeys, its nostrils opened sideways and were separated from one another by a thick division of cartilage (the *platyrrhine* – 'flat-nosed' – condition).

Yet in stark contrast to spider monkeys, the largest of which never attain a total height much in excess of 3½ ft, de Loys's paradoxical primate measured a mighty 5 ft 1¾ in – equalling all but the loftiest of chimpanzees. Also, its limbs appeared sturdier than those of spider monkeys – species specifically famed, and named, for their limbs' noticeably gracile, spider-like appearance. Similarly, its body seemed stockier, with broader shoulders. And as pointed out by French cryptozoologist Dr Bernard Heuvelmans in *On the Track of Unknown Animals* (1958), its thorax seemed longer and flatter, more like that of an Old World ape than like that of a New World spider monkey. Most significant of all: according to de Loys's testimony it was tailless (unlike *any* known species of South American primate), and only possessed thirty-two teeth (all known South American primates have thirty-six, occasionally more).

Following his return to Europe, de Loys consulted French zoologist Prof. George Montandon, and provided him with much information concerning his party's baffling discovery, plus the precious photograph, but was unable to offer any physical remains – though this is not as surprising as it may initially seem. After all, the appalling conditions that the expedition had faced during its jungle forays had been more

than enough to deal with, without the additional (and very considerable) problems that would have been posed by attempting to transport a hulking 5 ft carcase all too soon to transform into a stinking mass of putrefaction. Apparently, they did salvage the skull, but their party's cook ill-advisedly used it as a salt container. As a result it had completely disintegrated before their departure for Europe. (And a comparably regrettable fate allegedly befell the specimen's skin of greyish-brown fur too.)

Nevertheless, de Loys's testimony and the striking photograph sufficiently convinced Montandon that the creature had been something totally new and significant for him to publish a formal paper (*Comptes Rendus*, 11 March 1929), introducing it to the scientific world. Moreover, so certain was he that it represented a South American counterpart to the Old World anthropoids, i.e. a New World species of comparable evolutionary status to the gibbons, gorillas, orang utans, and chimpanzees, that he named its species *Ameranthropoides loysi* – 'Loys's American ape'.

Scientists throughout the world were astounded – the concept of a New World ape seemed so alien to zoological tradition (in which apes were strictly confined to the Old World) that most found it impossible to accept. So it was not long before a variety of published opposition to Montandon's views materialized. Among these was the uncompromising contribution by British primatologist Sir Arthur Keith, who sternly pronounced in *Man* (August 1929) that *Ameranthropoides* was nothing more than an ordinary spider monkey, and appeared very sceptical concerning its alleged absence of tail, great size, and depauperate dentition. In summary, he felt that at most it should merely have been named *Ateles loysi*, thereby allying it with the spider monkeys, and flatly rejecting Montandon's views that it was the Americas' answer to an anthropoid.

Similar, and sometimes even stronger, views were expressed by many other zoologists. One aspect that attracted much adverse criticism and suspicion was the supposed taillessness of de Loys's 'ape'. Some authorities clearly felt that it appeared tailless in the photograph only because its tail had been deliberately cut off, or hidden from view. Certain others, like Francis Ashley-Montague, writing in *Scientific Monthly* (September 1929), seemed willing to accept that its taillessness was genuine, but suggested that this may not have been a natural feature; instead, it could have resulted from an accident at early infancy (adult male monkeys have often been known to bite off the tails of their offspring).

Also engendering much heated discussion and dissension was the creature's impressive height. Once again, some suspected a hoax. Montandon, however, recorded that the standard size for petrol crates of the type supporting its body in the photograph was known to be 18 in, which thereby provided a standard measurement that could be used to estimate accurately the creature's total height from the photograph alone (i.e. independent of de Loys's measurements taken directly from the creature itself). Using this method, a total height of 5 ft

was obtained, which agreed very closely with de Loys's result. To emphasize further the notable size of *Ameranthropoides*, and using identical crates to the example in de Loys's picture, Montandon even published a series of comparative photographs that showed men and spider monkeys sitting on the crates in the same pose as that of *Ameranthropoides* in the original photo. His critics, however, remained unconvinced – and ultimately they won the day.

In 1930, as a final attempt to silence and satisfy his opponents, Montandon's full scientific treatment of the anomalous *Ameranthropoides* was published, complete with a formidable list of pertinent references. It certainly *silenced* them, after a fashion – because it attracted no response at all. Time, though, has shown that it did not *satisfy* them – for *Ameranthropoides* is generally spoken of today (by those few who are actually aware of it or can still recall its history) as at best a monster of misidentification, based upon a specimen of *A. belzebuth* (which is the most robust species of spider monkey). At worst, it is summarily dismissed as a failed fraud.

Mystery animal researchers, however, are well aware that large ape-like creatures, walking bipedally and lacking tails, have been frequently reported by natives and Western explorers alike from many parts of South America, where they are referred to variously as the *mapinguary* (Brazil and Bolivia), *didi* (Guyana), *shiru* (Colombia), *vasitri* (Venezuela), etc. This lends support to de Loys's account and the proposed status of *Ameranthropoides* as a genuine New World equivalent of the apes. Accordingly, combining such testimony with various anatomical features of *Ameranthropoides*, some cryptozoologists have looked favourably upon its credentials as a major new discovery, but others have denounced it utterly as a disgraceful deception.

Dr Heuvelmans, for example, proffered the unusually massive body and robust limbs of *Ameranthropoides* with (assuming the veracity of de Loys's report) its abnormally small number of teeth and absence of tail as evidence for its distinction from any known species of spider monkey, and as indications of morphological convergence towards the Old World anthropoids. On the other hand, in the opinion of Ivan T. Sanderson (a cryptozoologist and, like Heuvelmans, a qualified zoologist), outlined tersely in *Abominable Snowmen: Legend Come to Life* (1961), its burly form was not the product of anatomical design, but rather the outcome of advanced decomposition inside its carcase – which had correspondingly swollen or 'blown' to yield a bloated body that would bear little resemblance to its form in the living state. Furthermore, he did not believe that it was tailless, and he alleged that the type of petrol crate on which it had been photographed was not 18 in high, but only 15½ in, which, if true, would decrease the creature's estimated height to within the range of *A. belzebuth*. More recently, Don Cousins has also questioned the crate's size, and has selected *A. belzebuth* as the likeliest identity for *Ameranthropoides* (*Wildlife*, April 1982). So who is right?

Overriding all anatomical aspects of this case in my opinion is one that has rarely been considered in the past, but its importance

impresses me greatly. I am referring to its psychological aspect, which to my mind offers the most persuasive reason for accepting de Loys's account. Quite simply, I find it difficult to believe that a team of geologists – with no professional interest in zoology, and whose principal concern must certainly have been to escape with their lives from the horrors experienced during their ill-fated expedition – would have the slightest interest in staging a scientific sham. Equally, after surviving the jungle's terrors, harassment and vitriolic accusations were without doubt the very last things wanted or needed by de Loys during his recuperation in the safety and peace of his European home.

Also, how can his critics explain the existence of centuries-old carvings and statues depicting large, tailless, ape-like beasts, found among the crumbling relics from long-gone civilizations in various South American (and also Mexican) localities? Just coincidence?

Ameranthropoides loysi is evidently a mystery still awaiting a satisfactory, conclusive solution – it may yet metamorphose into a major zoological revelation.

2 *The Phoenix and the Paradise Birds*

> The feelings of a naturalist who at last sees with his own eyes a creature of such extraordinary beauty and rarity so long sought after, would require a touch of the poet to reach full expression. I found myself on a remote island, far from the routes of the merchant fleets, I wandered through luxuriant tropical forests ... And here, in this world, I gazed upon the bird of paradise, the quintessence of beauty. I thought of the long vanished ages during which generation after generation of this creature ... lived and died – in dark, gloomy forests, where no intelligent eye beheld their loveliness. And I wondered at this lavish squandering of beauty.
>
> Alfred Russell Wallace, mid-nineteenth century diary

Native to New Guinea, its outlying islands, and (in the case of four species) the north-eastern perimeter of Australia, the dazzling, flamboyantly plumed birds of paradise first became known to a greater portion of the world during the sixteenth century, when skins of these exquisite species were brought to Europe by one of Ferdinand Magellan's vessels. That, at least, is the *official* history of these birds. Quite recently, however, evidence has been uncovered which strongly implies that the birds of paradise were known beyond Australasia many centuries before this, and also that they may well hold the key to the identity of two spectacular and celebrated birds of ancient mythology.

Egyptian Phoenix

The Egyptian phoenix must surely be the most famous of all fabulous birds. According to its legend's most familiar version, every 500 years it would construct its nest from twigs, cinnamon, myrrh, and perfumed herbs; then, as the heat from the intense Eastern sun ignited its nest, transforming it into a blazing pyre of conflagration, the phoenix would raise its oustretched wings and dance, before perishing utterly amidst the flames, which would flicker and burn as the years passed by until only ash remained. From this spent mass of cinders, a new phoenix would rise, reborn and whole, and wrap the remains of its nest in myrrh enclosed within aromatic leaves; it would then fashion this into an egg, and fly triumphantly to the temple of the Sun King at Heliopolis, Egypt, to place its egg on the temple's altar, before departing to construct a new nest and begin the cycle of self-immolation and resurrection all over again.

A selection of birds of paradise

Most of this has traditionally been dismissed as imaginative fiction. Admittedly, scholars have attempted to identify the phoenix with various known species, ranging from the peacock, flamingo, and golden pheasant *Chrysolophus pictus* to (with somewhat less conviction) certain exotic parrots and other brightly plumaged cagebirds imported from the tropics, but none of these identifications is very satisfactory. Alternatively, certain species of perching bird seemingly experience a pleasurable sensation from fanning their wings over burning straw or twigs; sightings of this could have contributed to the phoenix legend – discussed by Dr Maurice Burton in *Phoenix Reborn* (1959).

As documented by Texas University researcher Thomas Harrison (*Isis*, 1960), there had even been suggestions by some of the early naturalists and poets that the phoenix could have been based upon a bird of paradise, but as the phoenix legend considerably precedes these birds' 'official', sixteenth-century debut in the West, this possibility received short shrift – until 1957.

Upon the arrival of the first bird of paradise skins in Europe, their unparalleled beauty attracted equally unparalleled attention, not only from the scientific world but also from the fashion industry, whose wealthier patrons yearned to be as glamorously decorated in these extravagantly beautiful plumes as the birds of paradise themselves. During the nineteenth century, when Wallace and others finally spied living specimens in their native homelands, this insatiable demand set in motion a traffic in bird of paradise skins on so great a scale that it soon became evident to all that, if this trade continued for much longer, many species would become extinct within a very short space of time. Accordingly, many countries banned all import of these skins, and in the 1920s New Guinea banned their export, thereby freeing the most famous and magnificent members of its avifauna from any further massacres in the name of fashion, and enabling their much-depleted numbers to recover. Nevertheless, a certain degree of skin trade still occurred *within* New Guinea, and in 1957 a team of Australian scientists set out to discover the extent of this traffic – never dreaming that one of the outcomes of their investigations would be the disclosure of a hitherto unknown facet of the Egyptian phoenix myth.

According to a detailed account in *Purnell's Encyclopedia of Animal Life* (edited by Dr Maurice Burton and Robert Burton, 1968–70), the scientists learned to their astonishment that the New Guinea native tribes had been killing the birds of paradise to obtain their skins for trade with visiting Western seafarers *long before* the sixteenth century. In fact, this had been taking place as far back as 1000 BC, when bird of paradise skins were transported thousands of miles westwards to Phoenicia – birthplace of the phoenix legend. But that was not all. To preserve the skins' delicate plumes during their long sea journey from New Guinea to Phoenicia, the tribesmen had presented them to the sailors carefully wrapped in a covering of myrrh skilfully fashioned into an egg-shaped capsule, in turn enclosed within a parcel of burnt banana leaves. If we equate the banana leaves of reality with the aromatic leaves of legend, the result is an extraordinarily close

correspondence with the famous myth of the phoenix.

All that is missing is the blazing fire encompassing the bird on all sides – but this is the easiest aspect of all to explain via the bird of paradise hypothesis. One of the most magnificent and also one of the most abundant species (even during the height of the fashion trade, and even though it was especially sought-after due to its sumptuous plumes) is *Paradisaea raggiana*, Count Raggi's bird of paradise. A crow-sized species, the male is a truly resplendent sight during the breeding season, set apart by the breathtaking brilliance of the scarlet plumes that surge from each side of its breast, cascading all around like a blazing eruption of scorching flames. During the male's pre-mating display, moreover, it expands and elevates these huge sprays of plumes, and vibrates its body, so that the resulting effect is uncannily like that of a bird dancing in the midst of a coruscating inferno of flame!

Considering that the abundance, the gorgeous appearance, and the notable popularity among plume-hunters of Count Raggi's bird of paradise would ensure that it was well-represented in all series of skins sold by the natives to the Phoenicians, and that the natives undoubtedly regaled them with vivid descriptions of its striking courtship display, need we really look any further for the origin of the Egyptian phoenix, and its dramatic dance of death in the fiery heart of its blazing nest?

Chinese Phoenix

Chinese mythology has its very own phoenix, commonly referred to in China as the *feng-huang*. Just like the Egyptian phoenix, it has been identified with a range of real birds, in particular the peacock and the ocellated pheasant *Rheinardia ocellata*, but in 1967, just a decade after the Australian team's bird of paradise revelations regarding the Egyptian phoenix myth, a Chinese researcher postulated that the birds of paradise may also have been the basis for the *feng-huang*.

In a lengthy paper written principally in Chinese (in the *Bulletin of the Institute of Ethnology of Taipeh, Academia Sinica*, autumn 1967), Tzu-Chiang Chou based his assertion upon four primary points, summarized as follows:

1 According to Tzu-Chiang Chou, in the hieroglyphics of the Shang Dynasty (1384–1111 BC), the shape of the Chinese character termed 'Feng', denoting the phoenix, resembled the typical, effusively-plumed *Paradisaea* birds of paradise more closely than any other proposed contender for this fabulous bird's identity.

2 The shape used for the character denoting the wind within this system of hieroglyphics was comparable to the Feng character, implying that the phoenix was in some way associated with the wind.

3 He offers many examples from ancient Chinese writings and from bird designs on the bronzewares of ancient China's pre-Chin period (i.e. prior to 221 BC) that suggest a *Paradisaea* species as their model.

4 He presents material that he interprets as evidence for believing that as recently as AD 1100 (during the Sung Dynasty),

southern China was home to two *native* species of bird of paradise, which have since become extinct.

From the examples of Shang Dynasty hieroglyphics depicting the 'Feng' and 'Wind' that Tzu-Chiang Chou provides, a certain, but by no means unequivocal, similarity to at least two different birds of paradise (greater, and king) is present, but his claim that a third example specifically comprises a depiction of a composite bird of paradise (created from the most striking characteristics of a wide range of different species) is less convincing. As for the wind connection, he points out that in Chinese the birds of paradise are referred to as 'wind-birds', because they fly against the wind.

Within the ancient Chinese texts, the Chinese phoenix is described as having colourful plumage, long tufts of feathers sprouting from its flanks, a fondness for dancing, and communal behaviour – all features shared by the *Paradisaea* birds of paradise (whose males do display in groups rather than singly). Conversely, in more recent Chinese accounts a very different phoenix is described – a somewhat grotesque entity with a snake's neck, a tortoise's shell, and a fishtail – but Tzu-Chiang Chou believes that this image is wholly imaginary, not based upon observations of real forms.

So far, then, Tzu-Chiang Chou's evidence for the identification of the Chinese phoenix as a *Paradisaea* bird of paradise is quite persuasive, but his fourth point is much more contentious. Quoting from various early Chinese encyclopedias, he provides descriptions of two exceptionally handsome birds supposedly native to China in those long-departed days, at least according to the authors of the descriptions. One bird, allegedly inhabiting Canton Province during the Sung Dynasty, referred to by the natives as the *feng-huang*, and said to have long sashes of red plumes on its flanks, beneath its wings, is identified by Tzu-Chiang Chou as the red bird of paradise *Paradisaea rubra*, officially known only from the Western Papuan islands of Saonet, Waigeu, and Batanta (and perhaps Ghemien too). The other mystery bird, reported from Kwangsi Province, again during the Sung Dynasty, and called the *u-feng* or black phoenix, was reputedly bluish-green and purple, with a head crest and an elongated tail with bunches of feathers at each end; Tzu-Chiang Chou considers this to be the long-tailed sicklebill bird of paradise *Epimachus fastosus* (formerly *magnus*).

These identifications, however, are far from precise. Goldie's bird of paradise *Paradisaea decora* and the earlier-mentioned Count Raggi's also have sprays of long red plumes emerging from their flanks beneath their wings; and the sicklebills do not have crests – the equally long-tailed species of astrapia do, but (in common with the sicklebills) they do not have bunches of feathers at each end of their tails. In any event, I consider it highly unlikely that any genuine birds of paradise have ever been native to China, even if we accept Tzu-Chiang Chou's claim that in earlier days its climate was much warmer, and hence closer to the tropical temperatures of New Guinea.

Ornithological experts believe that the birds of paradise originated in the mid-mountain forests of New Guinea, and as the present diversity of species progressively evolved, the family's range gradually expanded, infiltrating north-eastern Australia as its distribution's southernmost limit and extending as far to the west as the Moluccas (home to Wallace's standardwing *Semioptera wallacei* and the paradise crow *Lycocorax pyrrhopterus*). It is reasonable to suppose, therefore, that if the family were to send representatives beyond the Moluccas, ultimately reaching southern China, it would do so either via the Philippines, a handy series of stepping stones to the Asian mainland and thence China, or via a longer Celebes-Borneo-Vietnam course. Yet there is no evidence for the former existence of birds of paradise in any of these countries, thereby undermining support for their onetime occurrence further north-west, in China itself.

It is far more likely that early travellers visiting New Guinea arrived at China with preserved bird of paradise skins, and perhaps even some live specimens, whose outstanding appearance would guarantee their documentation in major Chinese texts of the day – their authors probably being unaware that these birds had originated from beyond China.

Reverting back from oriental to occidental examples: in his *Feather Fashions and Bird Preservation* (1975), Robin Doughty provides extra reasons for suggesting that bird of paradise plumes were known in the Levant long before Magellan's voyages. And in Peter Lum's *Fabulous Beasts* (1951), Roman emperor Heliogabalus (reigned AD 218–222) is said to have *dined* upon a bird of paradise. Also, as V. Kiparsky noted in 1961 (see p. 198), basing his ideas upon accounts in ancient Russian literature tantalizingly comparable to bird of paradise descriptions, a trade in their plumes may have been taking place at a very early date in eastern Europe.

The Unexpected Phoenix of Little Tobago

Completing this account of birds of paradise far from home is a fully confirmed and totally unique modern-day example – a population of the greater bird of paradise *Paradisaea apoda* in residence on a tiny Caribbean island.

Native to southern New Guinea and the offshore Aru Islands, this species' numbers were depredated so severely for their cascading sprays of golden, gauze-like feathers during the fashion craze for these birds' plumes that *P. apoda* seemed surely destined for extinction. Someone who resolved to avert this disaster, however, was newspaper magnate Sir William Ingram. Deciding that the species' best hope lay in repatriation far beyond the threat of the plume industry, Sir William (not a person given to small measures) bought an entire islet – uninhabited Little Tobago in the West Indies, whose tropical climate would provide a home-from-home environment – and established a warden-monitored colony of *P. apoda* there, comprising just under fifty immature birds captured alive during an expedition to the Aru Islands in 1909.

Many introductions of exotic species from one part of the world to another have failed dismally, but happily the birds of paradise seemed to thrive in their new home; and even though (thankfully) the introduction's original purpose had been rendered obsolete – the plume industry collapsed before this species could become extinct in its native lands – the West Indian contingent was permitted to remain on Little Tobago after Sir William's death. Over the years, the population remained relatively constant, rarely exceeding or falling much below the twenty to thirty individuals mark. But then came Hurricane Flora, a meteorological monster that mercilessly lashed Little Tobago one devastating day in 1963, and remorselessly swept most of the hapless birds of paradise out into the rampaging waves, to their inevitable death. Only a handful remained alive, and most of those were males. The plucky little population was doomed – no specimen has been recorded from the islet for many years. The unexpected phoenix of Little Tobago had been extinguished not by flame but by wind and water, and just as surely as if it had been exterminated by the plume-hunters back home in New Guinea.

3 Lophius *the Lurker* – *a Fish that Goes Fishing*

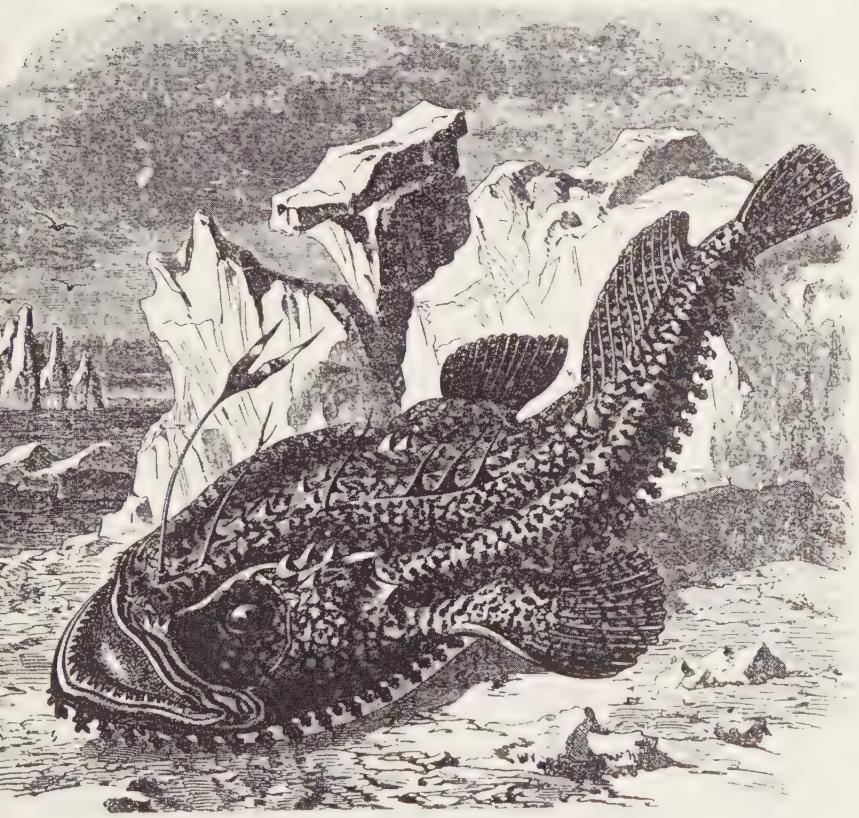
> It is impossible to mistake this fish for any other inhabitant of the ocean, its huge head – wide, flattened, and toad-like – its enormous and gaping mouth, with the rows of sharply-pointed teeth, its eyes set on the top of the head, and the three long spines, being signs which cannot be misunderstood.
>
> Reverend J.G. Wood, *Illustrated Natural History, Vol. 3*

Man may have no problem in identifying it, but, ironically, its lifestyle's success depends precisely upon the failure of prey victims to recognize one characteristic component of this fish's grotesque appearance, misunderstanding its true nature until it is too late – for this is *Lophius piscatorius*, whose repulsive form has earned it many weird names, including goosefish, frogfish, fishing-frog, sea-devil, wide-gab, and, most frequently used and most appropriate of all, the angler fish.

Measuring up to 5 ft long, and present along much of the European coastline, including relatively shallow stretches, the angler fish spends its days partially buried in mud or sand on the sea bottom. In concealing itself it is assisted by its nondescript, brownish coloration and the fringes of skin edging its body and head, which resemble strands of seaweed or debris, and which effectively obscure its outline and enable it to merge successfully with its background. There it lies in wait for its prey, earning its name by enticing them towards its cavernous mouth with a most ingenious bait.

On top of its head, the dorsal fin's first three rays are long and separate. The most anterior of these, however, is especially modified, transformed into an elongate rod-like spine, bearing at its tip a fleshy lure with more than a passing resemblance to a juicy pink worm, which the angler fish cunningly dangles near to its mouth, and jerks to and fro upon the approach of any potential prey victim. The effectiveness of this lure, therefore, is due not only to the verisimilitude of its tip's vermiform appearance, but also to the spine's remarkable degree of manoeuvrability. Back in the 1860s, in his *Illustrated Natural History*, the Revd J.G. Wood provided an excellent model that succinctly demonstrates the underlying mechanism behind its mobility:

> [The spine] is developed at its base into a ring, through which passes a staple of bone that proceeds from the head. The reader may obtain a very



Lophius piscatorius – *the voracious angler fish*

perfect idea of this beautiful piece of mechanism by taking a common iron skewer, slipping a staple through its ring and driving the staple into a board. It will be then seen that the skewer is capable of free motion in every direction.

Equipped with this highly efficient fishing rod, the lurking *Lophius* is adept at catching a wide variety of smaller fishes; its skilful technique was noted as far back as the time of Aristotle, 2300 years ago. Even so, not content with the prey that it can capture by this means, the voracious angler fish is more than willing to engulf much larger creatures that pass its way too, animals that are not attracted by its lure. Even gulls, ducks, and other water birds are included within its diet if they come within range of its voluminous maw. It will also take hold of a hooked fish being drawn out of the water by a human angler! And if caught with a load of other fishes during a commerical netting, an angler fish will lose no time in consuming as many of its companions as

it can, even as it expires in the fish bucket!

Alongside its sophisticated fishing rod and gigantic gape, the angler fish has another noteworthy feature. Its pectoral fins, held out from its body, are very specialized in form, each mounted on an elbow-like arrangement which enables them to operate almost like stumpy legs, permitting the fish to crawl upon the sea bottom like a bizarre underwater frog – more reasons for its 'fishing-frog' and 'frogfish' names.

All in all, it is a highly distinctive creature, whose grotesque appearance made it a popular exhibit in dried, preserved form at seaside resorts, especially during the nineteenth century. Examples can occasionally be found today as macabre souvenirs, often under their 'sea-devil' soubriquet. They should not be confused, however, with those extraordinary flattened creatures also sold at resorts in dried form and labelled similarly as 'devil-fishes'. These are nothing more than preserved skates or related species of ray (but *not* manta rays, which are the *true* devil-fishes), whose carcases have been skilfully modified by fishermen to resemble sinister, hideous-looking beasts with evil 'faces' and ornate, sleeve-like fins. In medieval times, such fraudulence was taken much further, yielding horrific dragon-like monsters incongruously referred to as Jenny Hanivers, but keeping this unique 'art form' wholly up-to-date are various Mexican 'devil-fish' specimens that have been passed off to unsuspecting tourists as grounded extraterrestrials!

A 'devil-fish' – merely a skilfully modified skate

If nothing else, Jenny Hanivers and devil-fishes clearly reveal how legends and myths can stay abreast of changing times and fashions, enabling a medieval dragon to metamorphose into an outer space alien with an ease even Ovid would have found surprising.

4 *The Curious Case of the Crowing Crested Cobra*

> A beast over which controversy rages at this moment is the 'crowing crested cobra', which, the natives say, is a snake, like a cobra, with a crest on its head and a loud, distinct cry like the crow of a cock.
>
> Captain William Hichens, *Discovery* (December 1937)

Judging from Hichens's description the above mystery beast must bear a close resemblance to the popular conception of a cockatrice – that mythical, cockscomb-crested, crowing serpent derived from an egg laid by a cockerel and hatched by a toad. Yet whereas the cockatrice is

The crowing crested cobra, according to eyewitness accounts

wholly fictional, a fabulous beast of Western legend, the existence of the crowing crested cobra is vehemently affirmed not only by native tribes spanning much of East and Central Africa, but also by a number of the Dark Continent's Western explorers, travellers, and settlers – notwithstanding the fact that by all the traditional tenets of herpetology, such a creature is a zoological impossibility.

Distribution, Description, and Lifestyle

Possibly the first Western account of this mysterious reptile was a short description included in Horace Waller's *The Last Journals of David Livingstone, vol.* II (1874), but many others have appeared since then. One of the most detailed is that of Dr J.O. Shircore, writing in 1944 from Karonga, Nyasaland (now Malawi) in *African Affairs*, which brings together much of what has been reported on this subject.

The alleged distribution of the crowing crested cobra is quite immense, covering some 800,000 square miles, from Natal northwards to Victoria Nyanza, and westwards to Lake Tanganyika and Zambia, and the Indian Ocean. Over this huge territory, it has acquired many names by the various tribes present. These names include: *bubu* (as noted by Livingstone) at Shupanga on the Lower Zambezi, *inkhomi* ('the killer') in Chi-ngoni and Chi-nkhonde, *hongo* in Chi-ngindo, *kovoko* in Ki-nyamwezi, *ngoshe* in Chi-wemba, *songo* in Chi-yao (Malawi), and *mbobo* by Zimbabwe natives. Also, in his checklist of apparently unknown animals (*Cryptozoology*, 1986), Dr Bernard Heuvelmans noted that it was referred to as *n'gok-wiki* by the Baya of the Central African Republic. And oddly, as reported by Henri Lhote and Helfried Weyer in their *Sahara* (1980), there are even stories that this vast desert houses pythons with hairy necks!

The names may be different, but its description is fairly constant. Reputed to measure up to 20 ft (thus exceeding the dreaded king cobra or hamadryad *Ophiophagus hannah*), the crowing crested cobra is said to be a very formidable and extremely ferocious, vicious species, usually buff-brown or greyish-black but with a scarlet face, and of arboreal inclination despite its great size. Its 'cobra' appellation is something of a misnomer, as it does not possess a hood. Instead, and distinguishing it instantly from all known snakes, it allegedly bears a prominent bright-red crest, resembling a cockscomb but projecting forwards rather than backwards. Both sexes have this crest, but the male additionally sports a conspicuous pair of red facial wattles, enhancing its similarity to a cockerel. The greatest correspondence between the latter fowl and this extraordinary snake, however, arises from the male's astonishing ability (according to eye-witness accounts) to crow loudly, just like a farmyard rooster! And to complete this remarkable parallel, the female apparently emits a hen-like clucking sound. In addition, both sexes can produce a distinctive warning note, best represented as *chu-chu-chu-chu*, repeated rapidly several times.

Just as curious as its appearance is its diet, for according to Shircore this huge snake subsists upon an almost exclusive diet of maggots,

obtained from the dead bodies of other animals. Moreover, it reputedly kills animals for the express purpose of consuming the maggots that will emerge from eggs (laid by flies) present on the rotting carcases – a trait, incidentally, also noted for certain smaller snakes, and even some rodents and cuckoos. Nevertheless, in view of its enormous size, it is highly unlikely that the crowing crested cobra could thrive solely upon maggots, and in his own account of this extraordinary creature in *Les Derniers Dragons d'Afrique* (1978), Heuvelmans notes that according to vet Dr Dennis A. Walker, specimens sighted in Southern Rhodesia (now Zimbabwe) prey upon hyraxes, those diminutive rodent-like hoofed mammals related to elephants. Walker also mentioned that in addition to their arboreal tendencies, these snakes could be found among kopjes (hillocks) and large rocks.

And if the huge red-crested serpent reported from the Congo region by animal collector Charles Cordier (*Zoo*, April 1973) is one and the same as the crowing crested cobra described from elsewhere, this mystery snake may also have aquatic inclinations, because the Congolese version can be found stretched out on trees alongside riverbanks.

The exceptional appearance of this huge but scientifically unrecognized serpent may be more than enough in itself to terrify anyone encountering it unexpectedly, but the principal reason for the absolute horror that it incites among the native tribes is due to the devastating combination of its unnerving willingness to attack people at the slightest provocation, and its deadly venom – so potent that a bite is supposedly followed almost instantaneously by death. According to Shircore, its usual mode of attack is to remain concealed upon branches overhanging a path, and then to lunge downwards at the head or face of any unwary person walking by underneath. Indeed, its Chi-yao name, *songo*, translates as 'that which strikes downwards and pricks the head'. Some natives have sought to safeguard themselves against its lethal onslaughts by carrying pots of boiling water on their heads when journeying through forested areas said to be inhabited by this highly dangerous creature; if the snake should then strike, it would burn or kill itself. Interestingly, in his *Memories of a Game-Ranger* (1948), Harry Wolhuter recalled that some southern African natives tell of a similar mystery snake, crested and vocal, called the *muhlambela*, and measuring almost 12 ft long. It too strikes at the heads of the unwary; however, its voice is a deer-like bleat rather than a cock-crow, and its crest is composed of feathers. (But see p. 34).

Some Identities and Some Relics

All of the above seems so fantastic, so nightmarish, that it should come as no surprise to learn that many zoologists are very sceptical as to whether such a macabre, phantasmagorical serpent as the crowing crested cobra could truly exist, still awaiting formal discovery and description by science. Surely it must be merely a particularly graphic example of primitive superstition and imagination, with no basis in

corporeal reality? This issue has inspired heated debate, but has yet to be resolved.

Former game warden Captain Charles Pitman believed the crowing crested cobra to be a non-existent composite entity, 'created' from the erroneous lumping together of reports appertaining to various totally different snakes. In his *Report on a Faunal Survey of Northern Rhodesia* (1934), Pitman stated that the Gaboon viper *Bitis gabonica* and the rhinoceros viper *B. nasicornis* (two highly venomous horned vipers inhabiting Zambia) have strikingly coloured heads, in keeping with the brightly hued face attributed to the crowing crested cobra. Furthermore, he noted that in Kawambwa the Gaboon viper is oddly claimed to be the 'crested snake which crows' (even though it isn't and doesn't).

Pitman also noted that the natives inhabiting parts of the Barotse Valley allege that the male black mamba *Dendroaspis polylepis*, another deadly species, has a crest and is capable of crowing. Although the latter ability has yet to be proven, there is some truth in their allegations regarding a crest. In *African Wild Life* (December 1961), Umtali Museum worker Donald G. Broadley recorded that an old mamba sometimes experiences difficulty in shedding the skin on its head, pieces sticking to its nape instead of peeling off; after successive unsatisfactory sloughings, a distinct ruff or crest of unshed skin is thus acquired. Several 'crested' snakes caught for identification have proven to be black mambas adorned in this way – including a monstrous 14½-ft specimen described by the natives as bearing feathers on its head (explaining the *muhlambela*?), shot by J.A.W. Bennetts in Natal (*African Wild Life*, 1956). Also, in his *Last Journals*, Livingstone suggested that the *bubu* was the black mamba; and F.W. Fitzsimons noted in *Snakes* (1932) that black mambas in trees do lunge down at the heads of people below.

So could it be that the crowing crested cobra is nothing more than a confusion or conceptual pot-pourri of the most poisonous formally recognized snakes encountered by tribes in East and Central Africa? A wholly symbolic representation of all that they fear most in serpentine form, rather than a valid, distinct, flesh-and blood species?

Without any complete or partial remains of crowing crested cobras, this hypothesis is quite tenable – however, some sundry remains of this extraordinary creature do appear to have been obtained. At the time of his report, Shircore owned what he believed to be the bony skeleton of the fleshy cockscomb, and a portion of the neck (containing several vertebrae), from one of these snakes. Describing the cockscomb:

> Its skeleton consists of a thin lanceolate plate of bone (1⅓ ins long by ½ in wide, at its broadest part) with a markedly rounded smooth ridge, ⅛ in wide, slightly overhanging both sides of the upper border, with a distinct voluted curve to the left. The lower border is sharp-edged and faintly ridged. The lateral surfaces are concave, throughout the long diameter. The whole fragment is eminently constructed for the insertion and attachment of muscles – much the same as the structure of the breast-bone of a bird. Some skin, part of which, spread smoothly above the base of the plate, on one side, is red in colour: and attached to the

lower angle is a dark wrinkled bit, which appears to be a remnant of the head-skin – all of which should be valuable for purposes of identification. A small portion of the bone, tapering towards both ends, ½ in long by ⅛ in wide, is missing from the lower anterior border, including the tip – it was broken off for use as medicine by the witch-doctor, from whom the specimens were obtained.

This structure is clearly something more than an artifact of unshed skin, and bearing in mind that its description is from the pen of a medical doctor, trained in meticulous scientific observation, we can have no doubt regarding its accuracy. As to the identity of the species from which these remains originated, no zoologist has so far reconciled them with any species currently known to science.

Shircore's report took the form of two notes, the second written some time later than the first, after which both were submitted to *African Affairs* and published as one. The above description appeared in the first note, but in the second he recorded that he had since obtained two further preserved specimens. One, from a relatively small crowing crested cobra, consisted of five lumbar vertebra, which were 7 mm long and 5 mm wide, with the concave, articulating face 2 mm from top to bottom and 3 mm across; two ribs 26 mm in length along the curve; a 10 x 8 mm piece of skin; and the laterally flattened, granular-textured skin-tip of its crest, measuring 6 mm long and 3 mm wide at its base. The second specimen was a single dorsal vertebra, said to have been obtained from the remains of a huge crowing crested cobra that had killed a man; the vertebra's articulating surfaces measured an impressive 8 × 9 mm.

Another very noteworthy report is that of John Knott (*African Wild Life*, September 1962). Driving home from Binga, in the Kariba area of Southern Rhodesia, during the end of May 1959, Knott accidentally ran over a large, jet-black snake measuring 6½–7 ft. The snake was mortally wounded, so that, although still alive, it was incapable of escape or attack when Knott stepped out of his Land Rover to investigate. He was very surprised to discover that the snake bore a distinct crest on its head, perfectly symmetrical and capable of being erected by way of five internal prop-like structures.

This description recalls a very peculiar Australian reptile known as the frilled lizard *Chlamydosaurus kingii*. The first sighting of this species by a Westerner was made on 8 October 1820 by Allan Cunningham at Careening Bay, Port Nelson, in Western Australia. As he recounted in P.P. King's *Narrative of a Survey of the Intertropical and Western Coasts of Australia Between the Years 1818 and 1822* (1827), 'I secured a lizard of extraordinary appearance, which had perched itself upon the stem of a small decayed tree. It had a curious crenated membrane like a ruff or tippet around its neck, which it spreads five inches in the form of an open umbrella.'

This lizard is totally harmless, eluding predators by sprinting away bipedally like a miniature dinosaur. If cornered, however, it expands its bizarre frill as a shock tactic. Interestingly, this frill is erected by means of bony structures extending into it from the lizard's mouth, thereby

Frilled lizard in threatening posture

expanding whenever the mouth is opened wide. A comparable structural arrangement, operated by muscles attached to the prop-like components observed by Knott, could mobilize the crest of the crowing crested cobra.

So deadly a beast as this snake obviously does not inspire willingness on the part of natives to capture specimens for scientific study – a plausible enough reason for the scarcity of remains. However, there is another important reason for that. According to Shircore, this species is very closely associated with snake-worship by certain tribes (especially those referring to it as *inkhomi*). Its skin and crest are prized by its worshippers, and other parts of its body are essential ingredients for many charms and medical potions utilized in tribal witchcraft and witch-doctor activity. Consequently, whenever such a snake *is* killed, its remains rarely if ever fall readily into the hands of anyone outside these tribes. Of course, if some ardent anthropologist were to serve an apprenticeship in one of these cults, he may then be given access to remains of this snake – but whether, under these conditions, he would ever be granted the opportunity to apply any scientific analysis to them is another matter entirely.

Judging from the above accounts, the crowing crested cobra would indeed seem to be real and distinct, at least on morphological grounds. But what about its strangest characteristic of all, its ability to crow? Is that genuine too, or is it unadulterated fantasy? Before attempting to examine this issue, let us first consider one further and extremely intriguing aspect of the crowing crested cobra case – the existence of a remarkable parallel to it many thousands of miles away.

Caribbean Counterparts

In his *The Romance of Natural History, Second Series* (1867), naturalist Philip H. Gosse reported that a peculiar snake, wholly unknown to science, apparently existed on certain of the islands in the West Indies chain. Except for its much shorter length, this snake bears an uncanny resemblance to Africa's crowing crested cobra. In 1845–46, Gosse visited Jamaica, and while there, 'I heard accounts of a wonderful animal occasionally seen in the eastern districts of the island, which was reported as a Snake with a cock's comb and wattles, and which crowed like a cock.' Sounds familiar, doesn't it? Yet surprisingly, in complete contrast to the attention attracted by Africa's crowing crested cobra, the Caribbean's counterpart seemed afterwards to sink into obscurity. In an attempt to rectify that sad situation, this chapter will provide all of the eye-witness account cited by Gosse in his book.

He received his first from a medical man of repute, who informed Gosse that,

> ... he had seen, in 1829, a serpent of about four feet in length, but of unwonted thickness, dull ochry in colour with well-defined dark spots, having on its head a sort of pyramidal helmet, somewhat lobed at the summit, of a pale red hue. The animal, however, was dead, and decomposition was already setting in. He informed me that the negroes

> of the district were well acquainted with it; and that they represented it as making a noise, not unlike the crowing of a cock, and as being addicted to preying on poultry.

This remarkable reptile has also been recorded from the island of Hispaniola (Santo Domingo), where one of Gosse's friends, Richard Hill, learned of it. According to Gosse, when visiting one of his Spanish acquaintances in Haiti, Hill had been informed by him that he had seen one of these snakes in that country's far eastern section.

> My friend's Spanish informant had seen the serpent with mandibles like a bird, with a cock's crest, with scarlet lobes or wattles; and he described its habits, – perhaps rather from common fame than from personal observation, – as a frequenter of hen-roosts, into which it would thrust its head, and deceive the young chickens by its imitative physiognomy, and by its attempts to crow, like their own Chanticleer. 'Il canta como un Gallo,' was the report in Hayti, just as in Jamaica.

Before Gosse's return to Europe, a Jamaican resident, Jasper Cargill, offered a sovereign for a specimen of this snake that he could present to Gosse. Unfortunately, Cargill was not successful in obtaining one, but Hill was later able to send Gosse details of two encounters with this snake in relation to Cargill, though no specimen was preserved on either occasion. The first had involved Cargill himself, some years before Gosse's visit to Jamaica.

> ... when visiting Skibo, in St. George's, an estate of his father's, in descending the mountain-road, his attention was drawn to a snake of a dark hue, that erected itself from amid some fragments of limestone-rock that lay about. It was about *four feet long*, and unusually *thick-bodied*. His surprise was greatly increased on perceiving that it was *crested*, and that from the side of the cheeks depended some *red-coloured flaps*, like gills or wattles. After gazing at him intently some time, with its head well erect, it drew itself in, and disappeared among the fragmentary rocks.

Cargill's second account concerned an incident involving his son, which took place on or around 30 March 1850. According to Hill,

> . some youngsters of the town came running to tell me of a curious snake, unlike any snake they had ever seen before, which young Cargill had shot, when out for a day's sport among the woodlands of a neighbouring penn. They described it as in all respects a serpent, but with a very curious shaped head, and with wattles on each side of its jaws. After taking it in hand and looking at it, they placed it in a hollow tree, intending to return for it when they should be coming home, but they had strolled from the place so far that it was inconvenient to retrace their steps when wearied with rambling.

As it happened, one of the youths did return the following morning, but although he was sure that he had found the correct tree, there was no sign of the snake's body, leading him to conjecture that it had been taken by rats during the night. When this incident was recounted to Mr

Hill, his godson Ulick Ramsay came to him to inform him that he too had spied such a snake only a short time earlier.

> ... not long previously, he had seen in the hand of the barrack-master-serjeant at the barracks in Spanish Town, a curious snake, which he, too, had shot among the rocks of a little line of eminences near the railway, about two miles out, called Craigallechie. It was a serpent with a curious shaped head, and projections on each side, which he likened to the fins of an eel, but said that they were close up to the jaws.

That was the last report cited by Gosse. What are we to make of these Greater Antillean anomalies? Certainly they all seem to refer to the same species but, just as certainly, one that is not recognized by science. Of course, it would be tempting to postulate that these West Indian reports are nothing more than derivations of the African crowing crested cobra beliefs, resettled in these islands along with all of the other folklore and superstitions conveyed here by the countless African natives who were mercilessly transported from their homes as slaves during those terrible years of the slave trade period. However, this cannot be the explanation, as such snakes have also been reported by Western observers, some of high standing (remember the well-respected medical man on Jamaica?). In fact, there is no greater reason for disbelieving the reports of West Indian crowing crested serpents than for disbelieving those of their African counterparts. All of this leads us again to that most fundamental obstacle to accepting such snakes' existence (whether in Africa or the Antilles). Namely, their much acclaimed ability to crow like a cockerel.

Snakes that Bleat, Bellow, Purr, Bark, Cough ... and Chime!

The familiar hissing sounds of snakes are produced by air being forced through the glottis (the opening from the back of the throat's pharynx into the windpipe); the pitch of the hiss is controlled by the width of the glottis's aperture. In addition, as I learnt from Colin McCarthy, herpetological expert at the British Museum (Natural History), there are certain species, such as the North American bull snake *Pituophis melanoleucus*, with an unusually well-developed glottis flap (epiglottis) that increases these sounds as air is blown against it. Indeed, so effective is this that the bull snake's bovine grunt (earning it its name) can be heard up to 100 ft away. But what about genuine cock-crows?

In his earlier-mentioned report on North Rhodesian fauna, Captain Pitman offered a singularly original and quite unforgettable explanation – postulating as the likely answer what must surely be the most macabre form of ventriloquism ever conceived!

According to Pitman, in those incidents on record featuring a snake that seemed to its bemused observer to be crowing, the snake was not actually making the sounds itself; on the contrary, the sounds were the screams of a prey victim that the snake was in the act of swallowing alive! In support of this ghoulish hypothesis, in his book *A Game Warden Takes Stock* (1942) Pitman cited the case of an African naturalist

who suddenly heard a strange squeaking cry nearby, and discovered to his great surprise that it was coming from a rhombic night adder *Causus rhombeatus* in the middle of a heap of stones. To his even greater surprise, he found that the adder contained a small toad, engulfed so recently that it was still alive, and which, in Pitman's opinion, was unquestionably responsible for the peculiar cries issuing from the adder's mouth.

Yet even if such an imaginative theory could be stretched to explain every single report of snakes that crow (which is itself highly unlikely, as the possibility of frequent encounters with snakes engaged in the very act of swallowing screaming prey victims must surely rate as exceedingly slim!) it is still unsatisfactory – because crowing cries are by no means the only unexpected type of sound to have been reported from African (and other) snakes. Also on file are accounts of snakes that bleat, roar, bellow, cough, purr, bark, and even emit metallic bell-like sounds.

A representative series of examples was provided during the interesting interchanges published in the London *Times* during the latter half of 1929. It began on 22 August, with a letter by Captain Tracy Philipps, reporting the existence in Kabale (in Kigezi, East Africa) of a snake allegedly able to produce a single, sustained bell-like note like that of some Ethiopian horns; the natives informed him that this animal was known locally as *nkweta*. That elicited a largely sceptical response on 24 August from Alleyne Leechman (former Director of Tanzania's Agricultural Research Station at Amani), though he did concede that noted British herpetologist E.G. Boulenger had admitted that a snake might make a sound comparable to the notes produced by a gently struck tuning fork.

On 26 August, Jan H. Koens of the Royal Empire Society announced that he had seen a 24-ft-long python raise itself up like a young tree and produce a deer-like bleat, and had heard an 11-ft black mamba cough like a monkey; he felt that they purposefully imitated the cries of their prey to entice them to approach. Worth noting here is that many years earlier Livingstone had mentioned a snake in South Africa referred to by the natives as *nogo putsane* – 'kid snake' – because it reputedly bleats like a young goat. Also of relevance is a note by explorer Leonard Clark in his *The Rivers Ran East* (1954) concerning the supposed existence in South America of a snake called *shushupe*, which allegedly emits a strange cry like that of a duck in distress to lure its prey within striking range. And on 27 August 1929, a letter by Sir Hector Duff reminded readers of *The Times* of an episode included in his *Nyasaland Under the Foreign Office* (1903), concerning a long drawn-out sound, like the rather metallic note of a wire in the wind, heard by him in the hills near Zomba, and which his native servant declared to be the cry of a certain type of large snake.

On 31 August G.P.L. James recalled that in India he had encountered several cobras that would produce a deep cat-like purr just before striking at their prey or it disturbed. (In 1931, in his definitive *Snakes of the World*, herpetologist Dr Raymond Ditmars also noted this, describing

the sound as a sharp sneeze-like hiss.) Then on 2 September, G.E. Davies suggested that the 'purr' was emitted to bemuse or 'fascinate' the prey victim – already mesmerized by the cobra's expanded hood. Worth noting is that three years later, on 27 September 1932, a letter to *The Times* by David Freeman recorded that in Malaya he had heard cobras uttering an exceedingly shrill note, which did not seem to have any warning purpose, but may have been related to mating.

On 30 December 1929, Captain Philipps expanded upon his earlier letter, adding that his mystery snake's local name, *nkweta*, meant 'I-you-am-calling', and that after encountering it and hearing it produce a sustained bell-like sound, he had recognised it as a puff adder. This corroborated a statement made by Captain G.B. Ritchie, who had noted in an *East Africa* article (September 1929), 'Puff adders calling their mates at breeding time emit a beautiful bell-like note, audible for about 200 yards. Dr. G. Prentice, whose attention I drew to this matter, personally proved it.'

In a letter to *The Times* of 7 September 1932, Philipps provided more details regarding this; he also noted that similar sounds produced by snakes had been heard by L.M. Nesbitt when crossing Ethiopia's Danakil desertlands in 1928 (*Geographical Journal*, 1930).

Probably the most astonishing letter of all, however, came from Mrs Duncan Carse, of Crowthorne, Berkshire (*The Times*, 5 October 1932), because her oddly vocal serpent was a specimen of *Natrix natrix*, the familiar European grass snake! One hot morning in summer 1932 she and her dog had spied a grass snake lying asleep in her garden. The dog froze,

> ... and at the same instant the snake 'spotted' us, and let out a clear bird-like call, obviously of alarm, and the next second had disappeared like a flash into the undergrowth. The 'note' of the snake was so loud that my husband, who was working in his studio several yards away, heard it distinctly, and came dashing out to see 'what sort of a weird bird' had flown into our garden!

Concluding her grass snake letter, Mrs Carse steadfastly maintained that: '... there is not the slightest doubt that this one screamed: a clear, peculiar, bird-like call, quite as loud as the note of a blackbird.'

All of this may seem quite unbelievable, but as mentioned by Heuvelmans, and also by Dr Maurice Burton when considering the matter in *More Animal Legends* (1959), reports describing virtually the same sounds for such snakes have emerged from many different localities, documented by eye-witnesses totally unknown to one another, and in completely separate publications, collectively yielding a formidable coincidence to explain away – unless these reports are truly based upon real incidents, involving snakes that really do produce these singularly unsnake-like sounds. Not surprisingly, and in agreement with Heuvelmans's sentiments, I feel the alternative to this, that of supporting Pitman's hypothesis, would be somewhat rash – as the explanation that such snake-emitted sounds are actually due to sightings of snakes containing assorted goats, deer, cows, dogs, cats,

and birds, all freshly engulfed and still alive (plus a goodly supply of self-ringing bells!) is in every sense extremely difficult to swallow!

Reasons Given in the Past for Dismissing Reports of Overly Vocal Snakes

And so we arrive at last at the crux of the whole crowing crested cobra problem. Can snakes really produce sounds other than their usual sibilant hisses? Diehard disbelievers have traditionally responded with two daunting arguments against this (as expressed in a long series of correspondence in *East Africa* during 1928). These are:

Argument 1 *It would be pointless for a snake to have a voice, whether for communication or for any other purpose, because snakes are totally deaf, completely unable to detect airborne sounds.*

The ear of a snake is very degenerate in comparison with that of other terrestrial reptiles. It has neither an eardrum nor an air-filled middle ear cavity, but it is able to detect ground-borne vibrations, because with snakes, the ear bone known as the stapes (which conducts airborne sounds to the inner ear in lizards) is connected to the quadrate bone – present at the upper jaw's rear end, attached to the braincase, and articulating with the lower jaw. Thus, when a snake rests its head on the ground, any vibrations passing through the ground will be transmitted via the lower jaw, quadrate, and stapes into the snake's inner ear. Relatively recently, however, and to the great surprise of herpetologists everywhere, it was shown that snakes could actually detect certain airborne sounds too: in 1960 researchers Drs E.G. Wever and J.A. Vernon reported that these supposedly deaf reptiles were really rather sensitive to airborne sounds within a frequency range of 100–500 Hz (*Journal of Auditory Research*.)

These findings were later expanded by Dr P.H. Hartline (*Journal of Experimental Biology*, 1971), whose series of experiments testing the sensitivity of snakes to ground-borne and airborne vibration revealed that in relation to frequencies within the 150–400 Hz range, the snake's auditory system was more sensitive than the system of vibration detectors present in its skin; moreover, between 200–400 Hz, the snake's hearing was more acute than that of a frog (which is very sensitive, though rather less so than that of mammals). In short, snakes are not deaf at all, and the findings of the above researchers lend credence to the possibility that future workers may unfurl evidence for even greater auditory ability among snakes.

Argument 2 *Snakes cannot possibly produce sounds other than the usual hisses, because they have no vocal cords.*

It is indeed true that although snakes have a voice-box (larynx), it does not contain any vocal cords. However, the same is also true for fishes, yet many species are known that are fully able to give voice to loud (sometimes quite stentorian) noises – as discussed in W.S. Berridge's *Animal Curiosities* (1922) and Burton's *More Animal Legends* (1959) among others. And remarkable as it may seem, those most versatile of animal vocalists the song-birds are also without vocal cords inside their larynx; their varied mellifluous and cacophonous

outpourings are due instead to a specialized structure called the syrinx, positioned some distance below the larynx. Clearly, the possession of vocal cords is not obligatory for a vertebrate to emit loud, distinctive sounds.

Nevertheless, the more recalcitrant sceptics of crowing crested cobra reports have continued to regard the snakes' lack of vocal cords as the last word on the matter, refusing to believe that without such structures snakes could ever crow (let alone bleat, bark, bellow, etc.). If only, somehow, a snake could be formally discovered that could utter something more, much more, than a mere hiss (even of *Pituophis* power), thereby instantly, and audibly, annihilating for all time this obsolete obstacle to believing that a crowing serpent could truly exist. It was a long time coming, but eventually such a find was indeed made, one that stupefied zoologists.

The Miaowing Snakes of Sarawak

In 1980, Philip Chapman from Bristol's City Museum took part in what proved to be a herpetologically historic scientific exploration of the huge Melinau limestone cave system in Sarawak's Gunung Mulu National Park. During the expedition team's penetration of the largely unknown and predominantly lightless world of Clearwater Cave (up to 10,000 ft underground), its members were suddenly confronted by a very loud and extremely eerie yowling sound, evidently coming from some animal just ahead. Very cautiously, almost fearfully, they shone their torches in its direction, to expose the originator of these disturbing noises, and saw to their amazement that they were being made by a snake! As I learnt from Phil Chapman, the snake in question was coiled up on the cave floor (*not* hanging from the wall, as some reports have alleged) and was emitting a hoarse, yowling miaow, just like a cat. Very surprisingly, however, this singular serpent did not represent a new species. On the contrary, it belonged to a form already well-known – the Bornean cave racer *Elaphe taeniurae grabowskyi*, a slender, blue, non-poisonous subspecies known not only from caves but also from above-ground, and of comparable appearance wherever found (*Sarawak Museum Journal*, December 1985). Yet somehow its extraordinary vocal capability had never before been recorded, or even suspected, by science.

Moreover, the team soon learnt something equally mystifying concerning these strange snakes. Their prey comprised fast-flying, cave-dwelling birds called swiftlets – which, astonishingly, they could catch in total darkness, while the birds were still *in flight*. Yet the cave racers cannot see the swiftlets, and without limbs or other tactile organs they cannot make physical contact with them except when actually striking. So when the birds are in flight, how can the snakes know where they are, let alone be able to catch them on the wing? It may be relatively easy to snatch a swiftlet flying through a narrow tunnel, but what about in the great open spaces inside the main caves themselves? Perhaps the racers detect the birds by smell, or respond to their wings'

vibrations carried through the air – or perhaps there is an even more ingenious method.

As the domain of the cave swiftlets is shrouded in continuous, absolute darkness they avoid collisions with one another, the cave walls, and other objects by carrying out echo-location, like bats, emitting shrill cries of extremely high frequency. Is it just a coincidence that their serpentine predator, the cave racer, is also able to give voice to a high, yowling cry? Could this be an attempt on the snake's part to mimic the birds' calls, in order to lure them within striking range, or perhaps even an attempt to disrupt their echo-location, to throw them off-course so that they fly towards the cave walls and thence to the waiting snakes? Such suggestions as these, however, require one further assumption – for the snakes to mimic the swiftlets' cries, they must therefore be able to detect them. And if this is genuinely the case, then in addition to the above activities involving its own vocal powers such a snake could also make use of an approaching swiftlet's – by gauging the precise direction and timing of its strike according to the direction and volume of the echo-location cries emitted by the bird (which thus betrays its precise position). I realize that the concept of a snake sensitive to high-frequency airborne sounds must seem extremely radical, but we must never forget that not so long ago no one believed that snakes could detect any airborne sounds at all.

Crowing Crested Conclusions

The case of the Bornean cave racer, a snake totally unaware that its cat-like cries are little short of herpetological heresy, demonstrates emphatically that the crowing crested cobra is far from the zoological impossibility that it is generally held to be even today. True, estimates of its total body length may well be exaggerated, as people do tend to enlarge a creature in direct proportion to their fear of it. On the other hand, its crest, albeit dramatic in appearance, is no more impossible than the equally impressive erectile cape of the frilled lizard, or the wing-like gliding membranes of the famous flying 'dragon' *Draco volitans* (which even has fleshy wattles too). And never again can its most controversial attribute, its diagnostic cock-crow, be raised as an insuperable objection to its existence.

Incidentally, although most of the unexpected sounds attributed to snakes in reports presented here genuinely seem to involve hitherto unsuspected vocal abilities on the part of these reptiles, there is one such category of sound that may be of a non-vocal nature. As far back as 1908 (*The Field*, 27 June), eminent British zoologist Dr Richard Lydekker noted that during the mating season the males of some species of American terrapin have two patches of horny tubercles on their hind legs which, like crickets, they rub together to produce a very loud, musical note, apparently to attract mates. According to Lydekker, similar sounds are also produced by *Teratoscincus* and *Ptenopus* gecko lizards, via friction on their tails' horny rings. Could a similar mechanism, involving the body scales of some snakes, be responsible

for those reports of snakes emitting bell-like or other musical sounds? Worth remembering is Captain Ritchie's allegation that puff adders attract their mates by producing such sounds – instantly recalling Lydekker's terrapin disclosure.

And finally: a perplexing mystery beast called the Paraguayan barking snake was widely reported in 1972. As I noted, however, in an article reviewing classic animal misidentifications (*Fate*, December 1988), the serpent in question, housed at Asuncion's Zoological Gardens, was merely an anaconda. Its barking prowess, moreover, was non-existent, as this was due not to Nature but simply to a mistranslation of its local Guarani name, *mboi-yagua* ('jaguar-snake' – alluding to its rosette markings), which somehow became 'dog snake'.

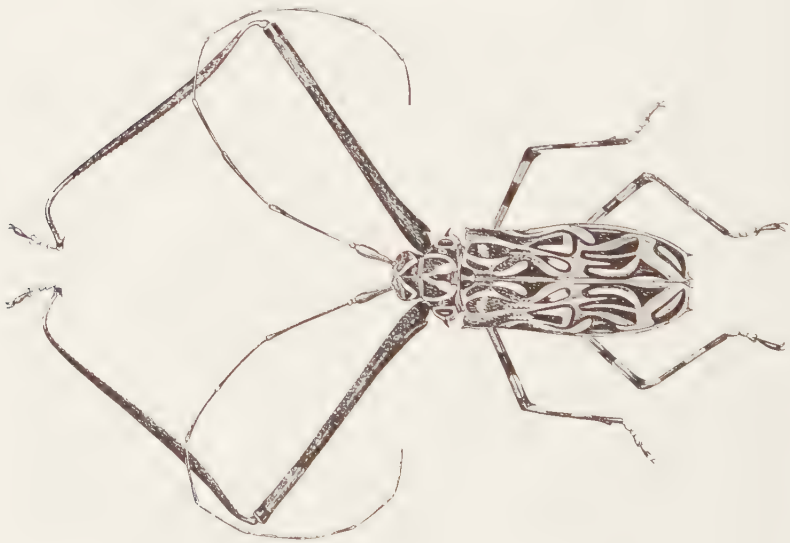
5 *The Harlequin Beetle – South America's Mobile Scorpion Shelter*

The beetle is a thing of beauty in the eyes of its mother.

Gypsy proverb

When British geneticist Prof. J.B.S. Haldane was asked what inferences could be drawn about the nature of God from a study of His works, he replied: 'An inordinate fondness for beetles'. His response was undoubtedly inspired by the knowledge that, for sheer diversity of form and plentitude of species, the beetles effortlessly surpass all other animal groups. More than 300,000 species are currently recognized, with many new ones described every year. Their numbers include some ostentatiously strange types, but few come any stranger than *Acrocinus longimanus*, the unconventional harlequin beetle – an insect of such finely wrought form and elegantly elaborate ornamentation that it

Harlequin beetle – carries scorpions under its wings



could easily be mistaken for a creation by one of Art Deco's more inspired exponents.

With a wide distribution, stretching southwards from Mexico to the tropical rain-forests of southern Brazil, this idiosyncratic wood-boring insect earns its common name from the unique complement of colours and markings borne upon its head, thorax, and long slender wing-cases (elytra). The predominant colours are orange, black, and brick-red, tastefully combined to yield a complicated design more than a little reminiscent of the intricately patterned costume worn by a stage harlequin and overlain by finer tracings in the style of delicate hieroglyphics. So attractive and striking is the overall effect that it is frequently reproduced by Brazilian Indians on their shields.

Even more conspicuous than its decorative markings and coloration, however, are its antennae and first pair of legs – due to their excessive length. Whereas the entire length of its body rarely exceeds 3 in, its forelegs are often twice this, and its remarkably slim antennae are even longer (in keeping with its membership of the longhorn beetle family – Cerambycidae).

Precisely engineered for a principally arboreal lifestyle, its immensely long fore-limbs are used for effectively grasping and retaining hold of wide tree stems and boughs, and are further assisted by sharp, curved spurs at their bases and by hooks on their tibial segments. If the beetle is forced to creep over the ground, conversely, these over-long limbs greatly impede its progress, transforming the adept tree-climber into an awkward, clumsy shuffler. Its elongated forelegs are also used as weapons, the males brandishing them at one another like medieval lances to win the fair tarsus of the lady harlequin.

Its unique, exotic appearance – so bizarre on first sight that it was erroneously classified in 1724 by J.J. Scheuchzer as an outlandish grasshopper – renders the harlequin instantly identifiable. Nevertheless, its detection is often achieved not by looking, but by listening, for it. Despite its large size and lengthy appendages, the harlequin is capable of sustaining flight – of a loud, rustling nature – but it has yet to master the techniques of directing it, so that it generally blunders into whatever object happens to be in the way, after which it promptly falls to the ground with an undignified and very audible thud. And once on the ground, its attempts at walking are accompanied by a distinctive creaking sound.

The noisy nature of its aerial and terrestrial movements are not alone in betraying this species' presence. Its weakness for the juices secreted by the bagasse tree *Bagassa guianensis* has been capitalized upon by the more canny of coleopterists. The bagasse's thick white secretions exude a peculiarly powerful, penetrating odour when freshly extracted, which can be detected by this beetle at a considerable distance. Consequently, beetle-collectors often wound a bagasse and then simply sit back to await the inevitable arrival of harlequins irresistibly attracted by the potent aroma of the tree's sap trickling from the wound. So familiar is the harlequin's fondness for this sap that it is widely known in its native lands as *mouche bagasse*.

A distinctive insect in every sense, the harlequin beetle's strangest of all claims to fame must surely be its role as a mobile home for other animals. As Ewald Reitter described in his magnificent tome *Beetles* (1961), the harlequin is parasitized by tiny acarine mites that live beneath its wings on the upper surface of its abdomen, but alleviating the effects of these unwelcome guests is a small species of scorpion, also living under the beetle's wings and preying upon the mites. Even when the harlequin takes to the air in its somewhat haphazard, blustering flight, its guests merely 'fasten their seatbelts' and come along too – the mites anchor themselves down with strong, sticky secretions, and the scorpions clasp firmly to any accessible area of soft skin in the joints of the beetle's armour-like external skeleton. A singularly novel instance of the dictum 'great fleas have little fleas', perhaps, but thoroughly in accord with everything else concerning the extraordinary harlequin beetle.

6 *Dreams of a Daisy Dog*

The little toy dog is covered with dust,
But sturdy and staunch he stands.

Eugene Field, *Little Boy Blue*

What is the connection between a highly popular breed of domestic toy dog and a little-known legend filling Cornish fishermen with superstitious horror? The answer is an episode in Chinese history that never happened – at least as far as official historical records are concerned. Don't worry if all of this seems rather confusing – because it *is*.

England has a deep-rooted and diverse history of phantom dogs. The most widely reported of these are the spectral black dogs – huge, jet-furred beasts with fiery eyes and sulphurous breath that reputedly haunt certain lonely country lanes, whose appearance is usually taken as an omen of doom, and whose touch is said to bring certain death. Also well documented in English lore are the fairy hounds – pure-white, calf-sized creatures with ruby eyes and ears, whose appearance can bode good or ill according to the specific circumstances involved.

Pekingese – identity of the daisy dog?

In the more remote coastal regions of Cornwall, however, a much less familiar and very different type of ghost dog is said to exist. In stark contrast to those already mentioned, this example is no bigger in size than a domestic cat, has a happy laughing face with pug-like nose and feathery ears, and carries a delicate plumed tail over its back. One could hardly wish for a more innocuous, harmless little animal, phantom or otherwise. Even its name is the epitome of cheeriness – the daisy dog. So why does its tiny, toy-like appearance fill with despair and dread the families in these regions whose menfolk have been fishermen generation after generation for hundreds of years?

The answer lies in a tale passed down into modern times from much earlier days – a tale whose events are as dark and doom-laden, merciless and mysterious, as the stormy shores and wind-whipped waves upon which they occurred. The most detailed account of this history that I have seen is contained within Ruth L. Tongue's excellent *Forgotten Folk-tales of the English Counties* (1970), from which my condensed version is adapted.

The time is the Elizabethan era (1558–1603). England's monarch, Elizabeth I, was held in awe not only by her country's subjects but also by the world at large. Her fame travelled widely, and sometimes inspired accounts that bordered upon the mystical and legendary. According to one of those, news of England's glorious monarch even penetrated as far as China, to the extent that its own emperor considered Elizabeth I to be a goddess – and as such deserving of the most precious gift that he could offer, namely, a pair of the sacred dogs of China, those small, golden, leonine creatures carried in the sleeves of mandarins and known today as pekingeses.

Needless to say, such precious animals could not be sent to England unaccompanied, without the necessary retinue that their sacred status demanded. And so an entire company was sent with them, comprising a royal princess as their personal guardian, a peerless mandarin as her guardian, a team of slaves and bodyguards to complete the entourage, plus an immense amount of gold to cover the expenses of the journey to England and to serve as an additional gift to Elizabeth I. Finally, as an ultimate precaution for their safety, the female pekingese was placed in a tiny ivory kennel wrapped in gold-embroidered silk, and a jewel-encrusted collar was placed around the neck of her mate.

The gold served its purpose well, and eventually the party neared the shores of Cornwall. Nonetheless, the long and arduous sea voyage had taken its toll – the only Chinese survivors were the dogs, their princess guardian, the mandarin, and a slave. At the same time, canine numbers had increased – the female pekingese had given birth to a thriving litter of puppies.

For the final stage of their journey, they were on board a ship crewed by Cornish fishermen, whose knowledge of their passengers' immense wealth and noble origin was initially sufficient to quell the superstitious doubts that they harboured concerning the silent princess, the inscrutable mandarin, and the strange dogs. Yet as the voyage continued, and the blustery winds and rolling waves became more

violent, with black storm clouds filling the skies and the sea seemingly intent upon sinking the ship and drowning everyone aboard her, the fishermen's fears intensified. In their eyes, the Chinese princess was a malevolent witch, who would drive them all to disaster – from which not even her gold could surely save them. And so the inevitable happened – mutiny!

The ship's captain was murdered, along with the hapless mandarin and slave, and the wild-eyed crew burst into the princess's cabin and threw her overboard. One of the fishermen stretched out his hand to her gold-wrapped box – and swiftly drew it back again, bleeding from a sharp bite inflicted by something inside it. Uncontrollable fear then overcame all of them, and the mysterious box, regardless of whether or not it contained gold, was quickly cast overboard too.

The savage waves bore the dead princess and her box onto a deserted Cornish shore. Yet due to the fishermen's dread and superstitions concerning them – heightened further by the rapid (fear-induced?) death of the man whose hand had been bitten – the area was soon deemed by locals to be haunted, a place of evil and ill-fortune, so that not even tales of the murdered princess's gold could persuade anyone to visit this forsaken spot. Not, that is, until one day when a good but simple-minded man came along.

He saw the body of the princess and clambered down to the shore to do whatever he could to help. Finding that she was dead, he cried, and as he did so he saw something move inside one of her long sleeves. So he carefully opened the sleeve, and to his great surprise he found huddled within it a very small, silky dog and a tiny gold-wrapped box. The little dog looked into the man's face and weakly wagged his tail, then allowed him to take off the box's silken covering. He found inside a broken ivory kennel, which he carefully opened, to reveal the bodies of the tiny mother and her puppies, all dead.

Watched closely by her little mate, the only survivor on that desolate, dusty beach, the man gently took out her body and those of her puppies, and lay them alongside one another. Being of simple mind but kind heart, the man decided to go to his priest and ask his advice, and so he told the little dog to guard all of the dead ones until he came back.

When he returned, he carefully buried the princess and each of the dogs, and although he was unable to say any prayers, he sought to do his best for them by planting a cross of daisies over the grave instead. Then he turned to the little dog, and ever so gently placed him on top. The little dog licked him, wagged his tail for the last time, and died. The poor man turned, with head bowed, and made his sorrowful way back home.

Since that day, Cornish legend has it that the ghost of that small silky dog with plumed tail has often been seen in this vicinity, sometimes sitting on a little plot of land bearing daisies planted in the shape of a cross. Should any fisherman draw near, however, and attempt to move the animal or disturb the site in any way, its little guardian will not hesitate to bite him. And according to legend, once bitten by the daisy dog, death follows swiftly and surely.

In her book noted earlier, Ruth Tongue mentioned that her attention was drawn to this legend by some old letters that had been given to her, which seemed genuine, dated between 1850 and 1860. These recounted an episode that had taken place a few months earlier, involving a medical doctor who was at that time acting as a locum at a locality near the Cornish coast, and was residing at the home of his sister (the letters' author) and her husband, the local clergyman. Whilst there, the doctor was called out to see a young fisherman of ancient Cornish fisherman ancestry whose hand had recently been severely injured, which he and his elder fisherman kin claimed to have resulted from the bite of the daisy dog. Accordingly, his premature death was forecast, despite the assurances of the doctor that if his hand were amputated, his life would not be in any danger. Following the amputation, the doctor thought no more of the case – until, shortly afterwards, the boy died. The doctor was unable to find any logical reason why he should have died, but the locals were not surprised – his fear of the daisy dog's bite had been sufficient.

Not long after that, while exploring a rarely visited gulley – feared locally as a haunted, accursed place – the doctor was startled to come upon a tiny, pug-nosed, silky dog with plumed tail, lying on a small plot of earth upon which daisies were growing in the configuration of a cross. Being only too mindful of recent events with the young fisherman, he lost no time in getting away from that eerie spot, and arrived back home shaking with fright. But more was to come.

When he recounted his experience to his sister, her husband the clergyman, also listening, grew very grim. He left the room for a moment, and then returned, after having taken something out of his room. He stated that it had been given to him by the young fisherman, just after his hand had been injured. The clergyman was carrying a small piece of beautiful golden embroidery, which he opened out. Inside was a section of what had once been a very small ivory casket. Relics from the daisy dog's grave?

If any or all of this is true, it is clear that the daisy dog legend is a singularly mystifying matter in much need of an explanation. And the most paradoxical part of it all is that it is totally at variance with accepted history: official records report that the pekingese was wholly unknown in Great Britain prior to the second half of the nineteenth century!

According to a delightful Chinese legend, this charming little breed resulted from a romantic interlude between a lion and a butterfly. (Rather less romantically, zoology maintains that it was derived from certain pug-like types.) Whatever its parentage, however, the pekingese has a very ancient history, possibly dating back as far as 2000 BC. As revealed by Beverley Pisano in *Pekingese* (1981), for many centuries it was worshipped in Chinese temples, and owned exclusively by the Imperial family in the Forbidden City of Peking. Pisano also notes that in New York's Museum of Art, within the Bishop collection of jade, is a carved crystal entitled 'Lions' that depicts a female pekingese with two puppies, portraying each with a very large,

flattened skull, a short but full muzzle, pendant (drooping) ears, a profuse mane of fur, and a plumed tail held over its back. In short, a perfect depiction of the daisy dog as described in the ancient Cornish legend. Furthermore, the crystal is dated as being from the Ming Dynasty (1368–1644), thereby demonstrating that such a breed did indeed exist in China at the time of England's Elizabethan era, adding support for the legend's veracity.

Yet despite this chronological correspondence, official history dictates that the pekingese was wholly restricted to China prior to the downfall of the Manchu emperors and the sacking of the Summer Palace, Peking, in 1860. Moreover, even after the sacking, strict imperial rules declared that the Chinese people should kill all such dogs – to prevent them from falling into the hands of the foreign invaders. Happily, however, this edict was not totally adhered to, and a few were transported to England. In October 1860, four small pekingeses were presented to Queen Victoria by Lieutenant Dunne; three of these were used for breeding purposes by the Duke of Richmond, who succeeded in establishing a world-famous strain, from which Western pekingeses have since been derived.

And so the daisy dog mystery remains unsolved. There is no doubt from local descriptions that the identity of this dream-like dog, whether corporeal or spectral, is indeed a pekingese. So despite this breed's *official* history, could the daisy dog legend be true after all? Against all the odds, did a pair of pekingeses make their way as sacred animals from the mysterious land of China to the regal world of Elizabethan England, only to face an ignominious death on a desolate Cornish shore, sometime during the 1500s? The historians would of course dismiss such a possibility without hesitation – but it would be unwise to adopt such an attitude in certain parts of Cornwall, especially in the hearing of their fishermen, for whom the daisy dog remains far more than a mere myth.

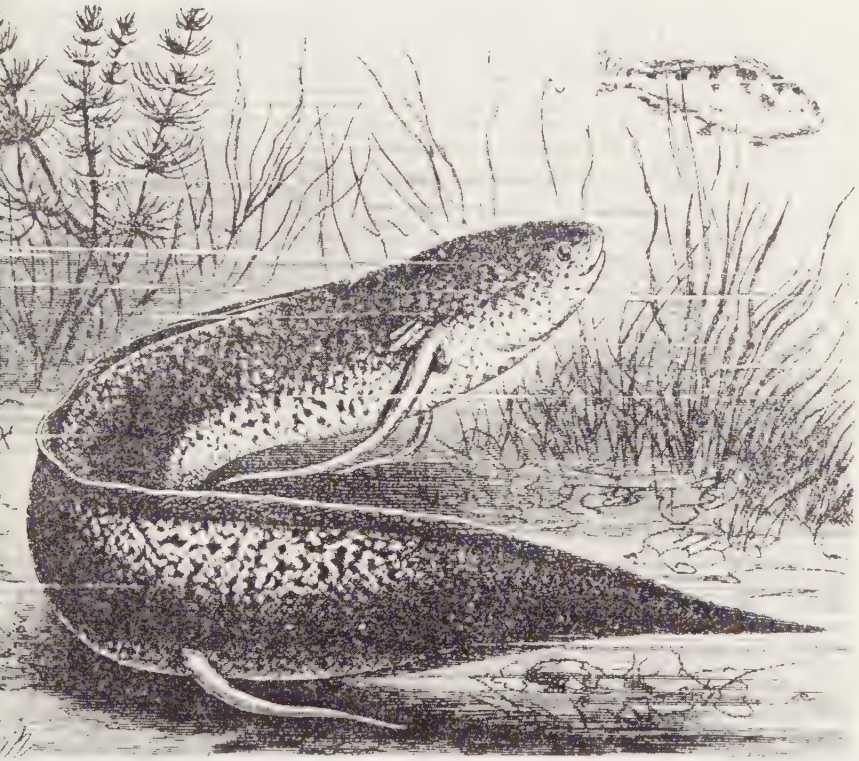
7 *Riddle of the* Buru, *and the Lungfish Link*

> The lung-fishes constitute a sub-class of particular interest, inasmuch as they present many striking resemblances to the land-dwelling Amphibians (frogs, toads, etc.), and the original discovery of these fishes was followed by violent controversies concerning their true position in the animal kingdom.
>
> J.R. Norman, *Hutchinson's Animals of all Countries*

Known scientifically as dipnoans ('double noses') because they have external *and* internal nostrils, lungfishes are undoubtedly among the most unusual of all modern-day fishes, with an air-bladder modified into lungs (either single or paired) richly supplied with blood, paired fleshy fins, an odd but characteristic pointed tail, and an overall appearance reminiscent of some strange hybrid of eel and overgrown newt. Little wonder, then, that they so greatly perturbed zoologists when first discovered.

Although lungfishes have an extensive fossil history, only six modern-day species are known, which exhibit a curiously dispersed distribution. The first species to be brought to scientific notice was the tiny-finned, eel-like *garamuru* or South American lungfish *Lepidosiren paradoxa*, when in 1837 Dr Johann Natterer captured two specimens – one in a swamp on the Amazon's left bank, and the other in a pool near Borba, on an Amazon tributary called the Madeira. Next to be discovered were the four *Protopterus* species from Africa – slim-bodied with thin lengthy fins. And in 1870 the most primitive modern-day species was formally described from Queensland – *Neoceratodus forsteri*, the Australian lungfish. Much more robust than the others, with surprisingly sturdy, limb-like fins, and only a single lung (each of the other living lungfish species has a pair), *Neoceratodus* is considered sufficiently distinct to warrant its own taxonomic family; moreover, its teeth are so similar to those of the archaic fossil genus *Ceratodus* that it is thought of as a 'living fossil'.

These, then, are the *known* present-day lungfishes – which, seemingly for no good reason, lack any type of Asian representative. Or do they? In fact, it is possible that until quite recently there was an extra species, much larger than the others, inhabiting certain swamplands in the Assam region of the Outer Himalayas.



African lungfish Protopterus

In 1948, news correspondent Ralph Izzard of the London *Daily Mail* accompanied explorer Charles Stonor on a unique expedition to an eastern Himalayan swamp valley called Rilo, close to Assam's Dafla Hills. The object of their expedition was to seek a mysterious creature called the *buru*, of which Stonor had learned during two trips made at the close of World War II with anthropologist J.P. Mills to another valley, to the north-east of these hills, called Apa Tani. According to the Apa Tani natives, the *buru* had been exterminated here when their ancestors had drained the valley's swamplands. In contrast, the Rilo natives maintained that it still existed in their valley's swamps. Sadly, however, Stonor and Izzard failed to find any evidence for this assertion. Nevertheless, their searches were not wholly in vain. During the Apa Tani expeditions, Mills had meticulously recorded the detailed, quite matter-of-fact descriptions of the *buru* recounted by the Apa Tanis, which were based upon accounts passed down from their forefathers; and to those were added the largely comparable Rilo versions collected by Stonor and Izzard during their Rilo search. All of this information was carefully documented by Izzard in his subsequent

book *The Hunt For the Buru* (1951), and the following is a summary of this animal's description.

The *buru* was elongate, and roughly 11½–13½ ft in length – which included a 20-in head with a greatly extended, flat-tipped snout, behind which were its eyes. Its teeth were flattened, except for a single pair of larger, pointed teeth in both the upper and lower jaws, and its tongue was said to be forked. Its neck was about 3 ft long, and capable of being extruded or retracted. Its body was roundish, as was its tail, which tapered towards the tip, measured about 5 ft, and bore broad lobes running along the entire length of its upper and lower edges. The appearance of the *buru*'s limbs is somewhat uncertain: some of the natives attested that they were well-formed, roughly 20 in long, with claws; others asserted that they were nothing more than paired, lateral flanges, so that the animal seemed rather snake-like. Its skin was dark blue with white blotches and a wide white band down its body's underside, and resembled that of a scaleless fish in texture.

As for the *buru*'s lifestyle, it was reputedly wholly aquatic, rarely venturing on to land even for a short time, but sometimes extending its neck above the water surface to utter a loud, bellowing sound. It did not eat fish. Lastly, but of particular interest, the Rilo natives said that when the swamps dried up during the dry season, the *buru* remained in the layers of mud and sludge on the swamp bottom.

Izzard believed that the *buru* might have been a modern-day species of dinosaur. Since his book, few writers have mentioned this mystery beast, and its identity remains very much a matter of controversy. In

South American lungfish Lepidosiren

The Leviathans (revised 1976), the late Tim Dinsdale, the world-renowned Loch Ness monster authority, postulated from its description that it could have been some form of crocodile. Cryptozoologist Dr Roy P. Mackal, though, in *Searching For Hidden Animals* (1980), favours a large species of water-dwelling monitor lizard. The riddle of the *buru* has intrigued me for a long time, and after having given the matter some considerable thought I would like to offer a third contender – a giant lungfish. As will be seen, this identity provides a compelling correspondence relative to the *buru*'s general appearance and behaviour.

One of the most awkward characteristics to explain when attempting to reconcile the *buru* with a large reptilian species is its tendency to remain ensconced within the swamp-bottom mud when the waters dry up during the dry season. Certainly it seems unlikely that either crocodiles or monitors would (or could) stay submerged in this manner for extended periods of time. In contrast, it is well known that *Lepidosiren* and two *Protopterus* species burrow into the mud when their streams dry out during the hot summer months, and remain duly encased, in a resting state called aestivation, until the water returns. Indeed, the first specimen of *P. annectens* brought to Europe from its native Gambia, in 1837, was transported here whilst still entombed within its cocoon of mud and secreted slime. If the *buru* is (or was) a lungfish, comparable behaviour could explain its otherwise anomalous actions during the dry season.

The *buru*'s head was said to terminate in a great snout, flattened at the tip. This is a fair description of the head of *Lepidosiren* and *Protopterus*, whose eyes, moreover, are closely aligned behind the snout – another *buru* characteristic. The teeth of lungfishes consist of rows that yield connected ridges borne on thickened, fan-shaped plates, flattened in form and thus comparing closely with the flattened teeth described for the *buru*. In some species, smaller tooth-plates occur that are less flattened and separate – these could explain the pointed pairs of teeth reported for the *buru*.

Lungfishes do not have long necks. However, a modern-day species with the eel-like body of *Protopterus* or (especially) *Lepidosiren* but with pectoral fins positioned further back on its body (thus paralleling the condition present in some extinct lungfish species) could appear to the untrained observer to have a long 'neck', as described for the *buru*. The *buru*'s round body and tapering tail are features exhibited by modern-day lungfishes, and the lobes of the *buru*'s tail could be explained as merely a slight elaboration of the normal tail-fin possessed by all living lungfishes (a characteristically primitive, pointed type referred to as being protocercal). Furthermore, the tail-fin of *Protopterus* is indeed split dorsally into slight flukes.

As for the *buru*'s limbs, the lungfish identity can provide a close correspondence whether they were true limbs with clawed feet (according to some native reports), or merely paired lateral flanges that made the animal seem snake-like (according to certain other native reports). On the one hand, Australia's *Neoceratodus* has sturdy

flipper-like pelvic and pectoral fins, with rough spiny edges that do resemble claws. And on the other hand, the fins of *Protopterus* and *Lepidosiren* are indeed little more than paired lateral flanges with no real resemblance to limbs, thereby enhancing these fishes' anguinine appearance – to the extent that they could seem quite serpentine to a casual observer.

In actual fact, it is even possible that the *buru* had *both* types of limb (which would resolve the controversy regarding their shape). Like so many fish species, it might have been sexually dimorphic (i.e. possessing morphologically dissimilar sexes), with the limbs of one sex (probably the male) of more robust construction than those of the other.

The *buru*'s skin allegedly resembled that of a scaleless fish; closely conforming once again, the scales of *Protopterus* and *Lepidosiren* are concealed under a soft outer skin, so that they appear superficially scaleless. Also, whereas *Lepidosiren* and *Neoceratodus* are mostly brown in colour, *Protopterus* is pale pinkish-brown with dark blue-black blotches, so that it would not require too drastic a change in colour scheme to produce the *buru*'s bluish-brown shade and white blotches. Moreover, it is interesting to note that *Latimeria chalumnae*, that celebrated lobe-finned fish known as the coelacanth – only known survivor of an ancient piscean lineage and classed by some as the lungfishes' closest living relative – is steely-blue in colour and dappled with numerous white blotches, only fading to a dull brown following its death.

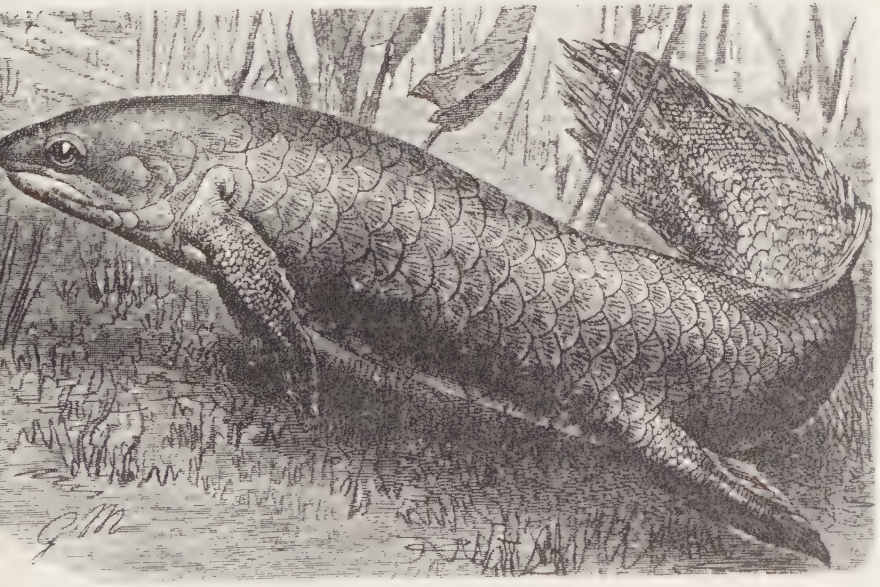
The *buru* was alleged to be emphatically aquatic, rarely venturing on to land and never spending any length of time there. However, the natives stated that sometimes it had been seen raising its head up out of the water and making a bellowing noise. This scenario is one that has strong lungfish associations for me. One of the most popular exhibits of the ichthyological practicals during my days as a zoology student at university was a living specimen of an African lungfish *Protopterus*, which was sometimes placed on display in order that we could observe its behaviour. As it happened, for much of the time there was actually very little we *could* observe, because it would spend most of the practical resting motionless at the bottom of its tank. Every so often, however, and usually when everyone's attention was diverted elsewhere, it would solemnly perform its *pièce de resistance*. All at once, without any prior warning, it would raise the front part of its large body upwards, until its head just touched the surface of the water. Sometimes it would then simply nudge the tip of its snout above the water surface, but if we were lucky (by now, everyone would have rushed up to its tank to watch its celebrated performance) it would actually raise its entire head, after which it would remain in this position for several minutes, ventilating. Although lungfishes have external nostrils, they breathe through their mouth, positioned at the very tip of the snout. This intake of air, readily perceived visually by the movements of its mouth and throat (proving that the lungfish is genuinely swallowing air) can also be very audible. The size of the *buru* was such that if it were truly a lungfish, the bellowing noise reported

when its head was visible above the water might well have been the very audible result of its ventilation period.

According to native testimony, the *buru* was not piscivorous – in stark contrast to crocodiles and aquatic monitors. But what about lungfishes? It has been demonstrated that the diet of *Protopterus* depends upon its body size. Up to 1 ft long, it eats only insect larvae; between 1 and 2 ft, its diet is a mixture of insect larvae, snails, and the occasional fish; above 2 ft, it eats only snails. Among the other lungfishes, crustaceans are also popular (as is plant material with *Neoceratodus*). Thus a diet in which fish is only an insignificant inclusion is typical for lungfishes.

All in all, there would seem to be only one noteworthy discrepancy between the *buru*'s appearance and that of lungfishes – its forked tongue. This is a feature typical of monitors, certain other lizards, and snakes, but not of lungfishes. In view of the overwhelming degree of correspondence with lungfishes on other morphological grounds, however, it is quite probable that this feature was *not* a genuine component of the *buru*'s make-up, but rather a fictional flourish – especially as it is common amongst primitive tribes from many parts of the world to ascribe a forked tongue to a creature (sometimes even to another tribe's members) that they fear or dislike.

In summary, on virtually every count a lungfish identity corresponds more than adequately with native descriptions of the *buru*. Overall, it seems to compare most closely with the elongate *Lepidosiren* or *Protopterus*, but its much larger size and possible *Neoceratodus*-like fins imply that it would have probably required a brand-new genus.



Australian lungfish Neoceratodus

South American arapaima – a bonytongue

Worthy of brief mention is a second putative identity for the *buru* involving a strange type of freshwater fish (again previously unconsidered), a type which, although totally unrelated to lungfishes, provides some striking parallels with them, and hence with the *buru*. Last survivors of an ancient line, the bonytongues or osteoglossids have an oddly discontinuous distribution, existing in northern Australia, south-east Asia, West and Central Africa, and eastern South America – thus almost precisely mirroring the distribution of the lungfishes, *except*, of course, for Asia. Moreover, they are long, cylindrical species, the most famous being the mighty 7-ft-long arapaima or pirarucu *Arapaima gigas* of South America, with flattened head and snout, oddly shaped fins, and, most intriguing of all, an air-bladder modified as a lung – all features again exhibited by the lungfishes. Most striking of all in terms of parallel lifestyles, however, is the bonytongues' method of breathing. For most of the time they remain beneath the water surface, but every so often they raise their body upwards, and poke their mouth up through the surface to gulp air. Sounds familiar? On the other hand, unlike some lungfishes, bonytongues do not aestivate.

Nevertheless, it would require greater morphological changes to

reconcile the *buru* with a bonytongue (even though there are already Asian forms) than with a lungfish. True, opponents of the lungfish identity might argue that the absence of *any* form of modern-day lungfish from Asia (though various fossil species have been found here) is a major obstacle to overcome. However, there is one final item of information that I have still to offer in favour of the lungfish identity, an item that could effectively provide this theory's missing segment of credibility. During my correspondence with Dr Roy Mackal regarding the *buru*, he informed me that he has collected excellent anecdotal reports that point to the existence in Vietnam of a 6-ft-long species of lungfish. Apart from being a zoological sensation, the discovery of such a creature would provide very considerable support for the identity of the *buru* as a larger, related species.

Clearly, as was shown in 1930 when the sole specimen of the enigmatic, Australian 'paddle-nosed lungfish' called *'Ompax spatuloides'* was exposed as a hoax (constructed from a *Neoceratodus* head, mullet body, and platypus beak!) the lungfishes have a continuing potential for inciting violent controversy among scientists.

8 *Recent Dinosaur Discoveries*

> Whatever doubts we may entertain as to the exact place on the zoological scale which these animals occupied, one feels sure that many of them were peculiar and gigantic; and I have experienced all the excitement of romance, as I have gone back into those immensely remote ages, and watched those shores along which these enormous and heteroclitic beings walked. Strange, indeed, is this menagerie of remote sandstone days.
>
> Prof. Edward Hitchcock, *Memoirs of the American Academy of Arts and Sciences* (1848)

Ever since 1824, the year that witnessed the first scientific description of a dinosaur, these 'terrible lizards' have attracted a degree of worldwide fame and recognition attained by few other animal forms, living or extinct. With hundreds of different species now known to science, and divided into two mighty lineages – the saurischids (lizard-hipped dinosaurs) and the ornithischids (bird-hipped dinosaurs) – they were indisputably the megastars of prehistory. Equally, whereas few newly discovered species of modern-day animal draw widespread media coverage, the excavation of a new species of dinosaur is guaranteed headline material right across the globe – a notable achievement indeed for a reptilian race that died out more than 60 million years ago, and a powerful expression of its potent popularity that shows no signs of diminishing, fuelled as it is by an ever-flowing stream of new and very significant discoveries. These include the following recent selection, currently delighting dinosaurophiles everywhere.

Tyrant Kings Great and Small – and Mistaken

One of the world's most famous dinosaurs must surely be the premier member of a group of flesh-eating saurischids known as theropods ('beast-tooted'), the gigantic carnivorous biped *Tyrannosaurus rex* – 'king of the tyrant lizards'. That suitably imposing name was first given to this monstrous 45-ft-long, 18½-ft-tall terror in 1905 by American scientist Henry Fairfield Osborn, after the first fairly intact skeleton had been unearthed in 1902 in northern Montana's Dawson County. Since then, additional remains have been found elsewhere in western North America, and also in China, but included no more than five or six reasonably complete examples. Then in 1988 two fossil hunters in Hell

Life-sized model of Tyrannosaurus rex

Creek, eastern Montana, came upon a *T. rex* skeleton that has amazed and delighted palaeontologists, because when excavated by a team led by Patrick Leiggi, a dinosaur researcher from the Museum of the Rockies in Bozeman, it was found to be almost complete. By November 1989, its skull (4 ft in length and crammed with ferocious 8-in-long serrated teeth), entire backbone, pelvis, and massively constructed hind legs had been disinterred from the encapsulating 65-million-year-old rock (dating the skeleton as from the late Cretaceous period), and it is now judged to be the most intact individual of this species discovered so far (*Daily Telegraph*, 3 November 1989).

T. rex has won worldwide acclaim as the largest species of carnivorous dinosaur currently known. Consequently, it came as something of a surprise to palaeontologists when, in 1988, they learnt that this massive meat-eater had a hitherto-unrecognized close relative of only pint-sized proportions. Moreover, the manner in which this miniature tyrannosaur was revealed was equally unexpected.

In 1987, renowned dinosaur expert Dr Robert Bakker, adjunct Curator of Palaeontology at Colorado University, was visiting Colorado's Cleveland Museum of Natural History when he spied some specimens stored in its basement. Among these was the skull of a tyrannosaur-like dinosaur that had been obtained in 1942, in Montana's Carter County. Although it was labelled as a *Gorgosaurus*, a much more primitive theropod, Bakker readily recognized from certain cranial features that it was most closely related to *T. rex*. In particular, its forward-pointing eye sockets, indicating that it had binocular vision, are a characteristic of advanced species of predator, and were known previously only in *T. rex* amongst the bigger forms. Yet it was not felt to be a *T. rex*, because the skull was very much smaller, and sufficiently distinct overall to suggest recognition as a wholly new species. In 1988, Bakker named it *Nanotyrannus lancensis*, the pygmy tyrannosaur – in a sense a somewhat oxymoronic appellation, as a complete specimen of this species is estimated to have attained a total length of 17 ft. Nonetheless, when compared with its 45-ft-long cousin, it *is* quite petite.

Possibly the most exciting aspect of this discovery came in April 1988, when Bakker's detailed examination of the *Nanotyrannus* skull revealed what seemed to be skin impressions on top of and on each side of its snout. As Bakker remarked in a newspaper interview (*Cleveland Plain Dealer*, 8 April 1988), should further tests confirm that they were skin impressions, the skull would constitute the only known tyrannosaur mummy; if so, 'then for the first time we will know what it would be like to pet a tyrannosaurus.'

Sadly, not all tyrannosaur news of recent times has been so welcome. Just a year after Cleveland had been celebrating its newly unmasked *Nanotyrannus*, the Japanese city of Mikasa on Hokkaido was bewailing the exposure of its own tyrannosaur skull as something very different indeed. In 1976, the skull of what was believed to be a *T. rex* was unearthed near Mikasa, and in best *T. rex* tradition attracted enormous public interest. So much so that a full-blown tourist industry was born, selling every imaginable variety of tyrannosaur trinket, and epitomized by an appropriately awesome concrete sculpture of an erect *T. rex* towering over an ever-present vista of visitors. Eventually the skull gained the ultimate accolade that Japan could bestow – the Cultural Agency granted it the title of a national 'Natural Treasure', the only fossil in Japan to receive this high honour.

And then it all went wrong – as revealed in a report of this tragic turnabout by Alun Anderson (*Nature*, 23 March 1989). For some time, many palaeontologists had been unhappy with the identification of the skull as that of a *T. rex*, so it was finally re-examined by Japan's National Science Museum – which found that, sure enough, it was not

from a tyrannosaur at all. Instead, it was from a giant extinct sea-lizard called a mosasaur. As mosasaurs, imposing though they may be, do not induce quite the same degree of publicity and appeal as the magical name *'Tyrannosaurus rex'*, however, the Mikasa City tourist industry was devastated by the exposure of their protégé as nothing more than a pretender to the throne of the tyrant lizards' king. Also, of course, there is the slight matter of what to do with a colossal concrete statue depicting a dinosaur that everyone there is now trying desperately to forget!

Encounters with Epanterias, Herrerasaurus, and the Tantalizing Troodon

Back in the Jurassic period, over 145 million years ago, when *T. rex* was merely a twinkle in the eye of the saurischians, one of its equally formidable ancestors was flourishing in Colorado. First discovered in the Morrison Rocks of Colorado's Masonville in 1877, it was named *Epanterias amplexus* and further remains were found in 1934, but the species as a whole attracted little attention and was generally thought to be synonymous with *Allosaurus*. Following a third find, however, this time in 1989 but near the locality of the first one back in 1877, dinosaur experts have finally been able to reconstruct the likely appearance of *Epanterias* in life, and now consider it to have been genuinely distinct from *Allosaurus* (*Daily Telegraph*, 5 January 1990). Dr Bakker estimates that this primitive theropod may have stood as tall as *T. rex*, supported by a very sturdy, powerful tail, and would have been strong enough to kill a full-grown *Brontosaurus* (now renamed *Apatosaurus*, incidentally). Even so, it seems that *Epanterias* was not one of the dinosaurian dynasty's longest survivors, apparently lasting a mere 1½ million years (quite a short time, geologically speaking) before vanishing into oblivion – for reasons that have yet to be ascertained.

Even more ancient than *Epanterias* was the 6½ to 8½-ft-tall *Herrerasaurus*, a bipedal carnivorous dinosaur named in 1963 by Reig after Victorino Herrera, and known from remains in San Juan and La Riosa, Argentina. In fact, thanks to the discovery of two virtually complete skeletons by a palaeontological team in 1989, it now lays claim to the title of the world's oldest true dinosaur, because the skeletons date back almost 230 million years (back to the Triassic). In a *New Scientist* report (11 November 1989), team member Dr Paul Sereno from Chicago University revealed that one skeleton was found quite by accident – weathering had just begun to expose the dinosaur's head and neck from the surrounding sandstone deposits, attracting the attention of the scientists, who were very surprised by its excellent degree of preservation. Even the minuscule earbones and the plates in the eyes' irises could be discerned, and the jaws proved particularly interesting, because they had a double hinge – an advanced feature contrasting sharply with the generally primitive level of structural development exhibited by the remainder of its skeleton, and thus implying that *Herrerasaurus* was a dinosaurian side-branch, not giving rise to any of the major lineages that subsequently appeared.

Yet another important find in the field of carnivorous dinosaurs was made during summer 1986 in Alberta's Dinosaur Provincial Park, by visiting Chinese palaeontologist Dr Tang Zhilu (*New Scientist*, 8 January 1987). It comprised the well-preserved braincase of a small but contentious carnivorous dinosaur named *Troodon*. Prior to the early 1980s, this dinosaur (first described back in 1856 by Leidy) was known only from its teeth – small and pointed with serrated edges, like those of a diminutive theropod – plus some other fragmentary remains. From this sparse amount of available material, researchers deduced that *Troodon* was indeed a small theropod. Then more complete remains were discovered, which to everyone's astonishment appeared to demonstrate that it was *not* a theropod. Contrary to all expectations, it seemed to be an ornithopod ('bird-footed'), i.e. it belonged to a group of ornithischid dinosaurs hitherto believed to have been exclusively herbivorous. The concept of a meat-eating ornithopod seemed as incongruous as a vegetarian *T. rex*! Happily, for palaeontology's peace of mind, a study in 1987 of all available *Troodon* material showed that it was not an ornithopod after all but (finally) a gracile carnivorous saurischid termed a saurornithoidid.

Notwithstanding this, the new *Troodon* braincase gave science a further upset. The middle ear in higher vertebrates is supplied with air via a series of chambers called the periotic sinuses. In *Troodon*, the structure of these sinuses was found to be identical not with that of dinosaurs but with that of birds. Also just like birds, it lacks a specific jaw plate termed the interdental plate (present in most dinosaurs). Combining these with certain other bird-like traits led Dr Phillip Currie from Alberta's Tyrell Museum of Palaeontology to believe that *Troodon* offers support for the increasingly popular belief that it was a true dinosaurian line of reptilians that gave rise to birds, and that birds should thus be classed as little more than feathered dinosaurs.

Every Schoolboy's Dream – Discovering a Dinosaur!

One of the most impressive dinosaur finds of recent years was made by a 7-year-old schoolboy. In August 1988, accompanied by his biology-teacher father, Thad Williams was fossil-hunting along a dried-up river bed approximately 10 miles from Texas's Fort Worth when he found the teeth, and later the skull and certain other bones, of what seemed to be a very large fossil beast, protruding out of the side of an embankment. After he and his father had gained the interest of the Fort Worth Museum of Science and History, a fifty-strong team of workers set out to excavate carefully and meticulously each fragile portion of the fossilised creature – which proved to be a 7-ft-tall ornithischid dinosaur, a bipedal herbivore named *Tenontosaurus* (*Daily Mail*, 17 December 1988). In contrast to the fragmentary remains of this creature usually found in the past, the Williams's specimen was almost complete, providing a lucid picture of this 20-ft-long plant-eater – characterized by a disproportionately long, deep tail, and sufficiently long forelimbs to enable it to walk on all fours if it so wished. Dating

back to the early Cretaceous period, *Tenontosaurus* was given its name by Ostrom in 1970; its remains have also been found in Arizona, Montana, and Oklahoma.

A Dinosaur called Happy, and Seismosaurus the Earth-Shaker

It may appear rather difficult to overlook a 70-ft-long species of dinosaur new to science – especially when it has been on public display for twenty-five years as a major museum exhibit – but this is exactly what happened with *Haplocanthosaurus delfsi*. During the 1950s a Yale University student named Edwin Delfs led an expedition to a river canyon just north of Colorado's Canon City, and while there he discovered the remains of an enormous sauropod ('lizard-footed') saurischid dinosaur closely related to the western European *Cetiosaurus* (superficially similar to the brontosaurs), but belonging to the genus *Haplocanthosaurus* and seemingly to its only known member species. So colossal were its remains that three successive expeditions over a period of four years were required to disinter it from the Late Jurassic rocks enclosing it, and even then some bones were lost when a flood washed them away. With artificial replicates substituting for those lost sections, however, the entire gigantic skeleton was finally reassembled, and since then it has been a principal exhibit in Colorado's Cleveland Museum of Natural History (the home of the only known *Nanotyrannus* specimen too).

During the mid-1980s, 'Happy' – the nickname by which this displayed dinosaur affectionately became known – attracted serious attention from palaeontologists, and by 1988 it had been identified as a hitherto undescribed *Haplocanthosaurus* species, which was older, bulkier, and more primitive than this genus's first-reported species (based upon two partial skeletons housed at Pittsburg's Carnegie Museum of Natural History). In the Cleveland Museum's journal, *Kirtlandia* (July 1988), Drs John McKintosh and Michael Williams formally named Happy's species *Haplocanthosaurus delfsi*, honouring the Yale student (today a Californian gynaecologist) whose perseverance yielded the magnificent specimen now known to be the oldest North American sauropod on record.

It may be hard to envisage any animal that could make Happy look small by comparison – but such a creature did exist about 144 million years ago. A relative of the familiar sauropod *Diplodocus*, it is known, very appropriately and evocatively, as *Seismosaurus* ('the earth-shaker'), because estimates obtained from studies on incomplete remains (vertebrae, some thigh bones, etc.) indicate that it attained a total length of 120–130 ft, and weighed at least 40 tons! The first remains from a skeleton of this unimaginably immense species were discovered in 1979 by a retired music teacher in an ancient stream bed, on a hilltop in New Mexico's Jemez Mountains, and in 1986 these were displayed at Albuquerque's Museum of Natural History. The rest of the skeleton, however, lies 10–16 ft further down inside the hill. In order to excavate these remains carefully, without any risk of damage to them, from 1987

the Los Alamos National Laboratory has been providing workers from the Museum of Natural History with sophisticated, ground-penetrating radar apparatus, which build up a 'picture' of the bones' precise layout and location within the hillside, so that excavators can guide their operations accordingly (*New Scientist*, 23 April 1987). This technique has been utilized alongside others involving sound waves, magnetometry, and scintillation counting – which can detect any uranium that the bones may contain (*The Sunday Times*, 30 October 1988). To date, the full skeleton has yet to be removed, but the sight of an assembled *Seismosaurus*, seemingly the lengthiest animal ever to have existed, will be well worth the wait – providing that a museum can be found with an exhibition hall long enough to house it.

Supersaurus and 'Ultrasaurus'

In 1972, palaeontologist Dr James Jensen uncovered some partial remains of an immense sauropod in Dry Mesa quarry, Colorado. Somewhat similar to the well-known *Brachiosaurus* and dating from the Late Jurassic period, the new species was nicknamed 'Supersaurus' (which later became its official name, *Supersaurus vivianae*), as its total length was estimated to be at least 80 ft and its weight roughly 30 tons. Seven years later, and in the very same quarry, Jensen did it again, this time spotting the remains of an even longer Late Jurassic sauropod, since referred to provisionally as 'Ultrasaurus' and believed to have attained a length of over 100 ft. Naturally, palaeontologists have been keen to uncover further remains of these Brobdingnagian browsers, and in 1988 Cliff Miles of the Byu Earth Sciences Museum and student Brian Versey came to the rescue, by successfully unearthing four *Supersaurus* vertebrae (each roughly 4½ ft long) and a 6-ft-tall hip bone, again from Dry Mesa quarry.

Other major events in the late 1980s dinosaur diary included the exhibition of six impressive Chinese dinosaur skeletons at Cardiff's National Museum of Wales in 1987 and later at the British Museum (Natural History), loaned from Beijing's Institute of Vertebrate Palaeontology and Palaeoanthropology; and two major dinosaur-seeking quests in 1988. One was a Sino-Canadian expedition to the Gobi Desert, the other a British undertaking to the Sahara. The last word, however, belongs to three major contributions provided by amateur UK fossil hunters.

'Claws' and the Cotswolds

One blustery day in January 1983 Bill Walker was exploring a muddy claypit in Ockley, Surrey, when he spied a strange object protruding out of some sludge nearby. To his dismay, when he attempted to extract it the object broke apart, but happily he was able to fit the pieces back together. When all of the mud had been wiped off, his puzzling find revealed itself to be a huge curved claw, measuring 1 ft in length. Unable to name its species, Walker took it to the British Museum. In

May 1983, a team of museum workers spent a month assiduously excavating the remains of the creature from the claypit, and then for the next three years they were painstakingly pieced together and studied minutely to discover their owner's identity. Inevitably nicknamed 'Claws' by the press in recognition of its most outstanding physical attribute, it proved to be a large but previously unknown species of theropod dinosaur, 30 ft in total length, with a long, flattened crocodile-like head whose jaws were amply supplied with small pointed teeth. Overall, its species was so distinct from all others that it required a brand-new genus.

In a *Nature* paper of 27 November 1986, Britain's long-demised former inhabitant was officially described by the museum's two leading dinosaur experts, Drs Alan J. Charig and Angela Milner, who christened it *Baryonyx walkeri* ('Walker's heavy claw'), honouring its discoverer and emphasizing its most publicized feature. Believed to have dwelled alongside riverbanks, spending its days hauling fishes from the water in best grizzly bear style with its hook-like claws, *Baryonyx* proved to be not only a radically new genus and species of theropod, but also the first reasonably complete theropod from lower Cretaceous rocks obtained anywhere in the world.

In 1987, local amateur geologist Kevin Gardner discovered remains of a 180-million-year-old theropod in a Cotswolds quarry, at Moreton-in-Marsh. In a London *Times* report (16 November 1987), Gloucester City Museum's deputy curator, David Dartnell, hailed Gardner's discovery – a tooth and some vertebrae belonging to a 20-ft *Megalosaurus* – as the best dinosaur find this century for Gloucestershire.

That may be so, but it was also in 1987, and once again in a Cotswolds quarry, that student Brian Boneham discovered the first remains of what has proven to be a 25-ft-long, mid-Jurassic ancestor of the famous plated *Stegosaurus*. Known as *Lexovisaurus*, this plant-eating ornithischid dinosaur has also been recorded from France (it is named after the Lexovi tribe of northwest France), and the excavated portions of the Cotswolds example are now on show at Gloucester City Museum (*Daily Telegraph*, 24 October 1990).

It would be impossible to predict the dinosaur disclosures of the 1990s, but we *can* predict with a measurable degree of confidence that whatever *is* found will definitely attract more than even a dinosaur-sized degree of attention!

9 *Platypus and Echidna – Australia's Electrifying Egg Layers*

I sing the body electric

Walt Whitman, *Leaves of Grass*

The echidnas or spiny anteaters and the famous duck-billed platypus *Ornithorhynchus anatinus* belong to a very primitive mammalian order known as the monotremes, and are renowned for being the only modern-day mammals that lay eggs – a most unexpected discovery first made known to science in 1884. Much more recently, science has shown that these strange creatures possess an equally unexpected 'sixth sense' – they can detect electrical fields *without* making physical contact with their source!

The first revelation came in early 1986, from an Australian National

Platypus – responds to prey-generated electricity

University team headed by German zoologist Dr Henning Scheich of Darmstadt's Technical University. It is well known that the aquatic platypus eats freshwater crustaceans, fishes, insects, and frogs – but how does it find them? When a platypus dives underwater, it closes its eyes and ears, and special valves seal off its nostrils, so that it cannot see, hear, or smell its prey. Consequently it was assumed that it used its large rubbery bill as a tactile (touch-sensitive) organ, detecting the water currents created by its prey's swimming movements. Yet this theory has never completely satisfied scientists – more than half a century ago, Australian naturalist Harry Burrell had argued that this method would be very inefficient. A much more effective one must be used – but what was it?

Dr Scheich and colleagues were aware that certain other aquatic predators, notably sharks, can respond to the electrical impulses produced by a prey individual's neuromuscular system (nerves and muscles) as it moves, these impulses betraying the prey's presence to the shark. No mammal, however, was known to be sensitive to these prey-generated electrical fields. At the same time, no one had ever *tested* a mammal for this ability – a situation that Scheich and company decided to rectify.

As fully described in their subsequent *Nature* paper (30 January 1986), they placed a tiny 1.5-volt alkaline battery on the floor of a pool, and waited to see what the pool's occupant, a platypus, would do. What it did was quite sensational – it attacked the battery with its bill, seizing it with quick snapping actions, each time that the battery was introduced into the pool. Now remember: underwater, a platypus cannot see, hear, or smell, and the battery was stationary, not stirring up any water currents for the platypus to detect. So how did the platypus know that the battery was there, and how was it able to attack it so precisely time after time? There could be only one answer – the platypus was able to home in on the electrical field being generated by the battery.

Verifying this, the team showed that when a platypus was offered the choice of a live battery and a dead battery, it chose the live one each time. Similarly, it chose a live battery in preference to the tail of a shrimp upon which it normally preys, the reason being that the battery emitted a more powerful electrical field than did the neuromuscular system of the shrimp's tail; as far as the platypus was concerned, therefore, the battery was a bigger meal. The team even discovered that when they hid the live battery behind a hollow brick, the platypus would attempt to move the brick away with its bill to reach the battery. Several different platypuses were used in the tests, and all behaved in the same way. Thus the next stage was to discover how it could do this.

By artificially stimulating the platypus's bill with mild electrical currents and observing its brain's activity, Scheich established that the bill was indeed the organ responsible for the species' electrosensitivity. He then suggested that the bill must possess specialized regions (electroreceptors) that can receive underwater electrical signals and pass their information to the brain, which uses it to guide the platypus to the signals' source – its prey. As for the pathway connecting the

electroreceptors with the brain, Scheich suspected that this would prove to be the trigeminal nerve – a major nerve linking the brain with the nose and jaws.

Two years later his assumption was proven correct, when in May 1988 a team from Melbourne's Monash University led by Dr Uwe Proske announced that this was truly the route taken. Moreover, they had succeeded in identifying three sites of electroreceptive activity on the platypus's bill – scattered along its left-hand edge (sites all over the bill have since been found). The receptors themselves had first been spied in 1984, by German anatomists Drs Karl Andres and Monika van During, but they were thought at that time to be nothing more than water-current detectors. The discovery that the trigeminal nerve was involved was particularly interesting, because in sharks and other fishes sensitive to electrical fields a totally different nerve was responsible – the auditory nerve. In mammals, this connects the brain with the ears, but in fishes it connects the brain with hair-like organs (aligned in a groove running along each of a fish's flanks) responsive to water currents, and is known as the acoustico-lateralis nerve. Also, whereas electrosensitive fishes can only respond to steady voltages *or* to alternating voltages, the platypus can respond to both, establishing that its electroreception system is more advanced than theirs (*New Scientist*, 12 May 1988).

The latest episode in this captivating history came in 1989, when the Monash team reported that the Australian echidna *Tachyglossus aculeatus* also bore electroreceptors on its snout – which in this species takes the form of a long, tubular structure through which it takes up ants, its staple diet. Once again, the receptors had originally been discovered by Andres and van During in 1984, but were not known to be electrosensitive until investigated by Proske and colleagues (*New Scientist*, 25 March 1989).

These revelations with the echidna are especially interesting and curious because, unlike the platypus, whose aquatic medium carries the electrical impulses of its prey directly to its bill, the echidna is a terrestrial species whose prey lives above-ground. So how can it detect their electrical impulses, when there is no conducting medium through which these can travel from prey to predator? It can, of course, touch its prey, but if it has to do this in order to sense the impulses, its entire electroreceptive system becomes redundant – because the echidna hunts with its eyes *open*, i.e. it can directly see its prey. All in all, there would seem little need for a system that detects its prey via their neuromuscular electrical output.

Some scientists, therefore, have wondered whether in the echidna this system is an evolutionary 'dead-end' – a system that very effectively served the echidna's ancestors (which may have been aquatic), but which has lost its usefulness in the modern-day terrestrial species. Yet experiments have shown that it still functions (albeit less flexibly than the platypus's). Furthermore, the echidna snout's permanently moist tip (which just so happens to be the location of its electroreceptors) may well be damp enough to conduct the minuscule electrical currents generated by ants, termites, worms, and other tiny prey species.

At present, the Monash team is continuing its research in an attempt to resolve these paradoxes, and hopes to test the New Guinea echidna *Zaglossus bruijni*, which has an even longer snout. The researchers are even speculating that more familiar species, such as moles, may be electrosensitive in this way. A whole new field of mammal behaviour may be awaiting recognition – one whose existence might never have been suspected, had it not been for two egg-laying mammals with a positive nose for electricity.

10 *'Classic' Extinct Birds – When did they* Really *Die out?*

> And over them triumphant Death his Dart
> Shook, but delaid to strike
>
> John Milton, *Paradise Lost*

The passenger pigeon, Carolina parakeet, pink-headed duck, moas, great auk, huia, and dodo are 'classic' extinct birds. Their dates of demise are so familiar to all ornithological students through faithful repetition in successive works dealing with vanished species that any suggestion that they may be other than immutable is generally considered to be little short of scientific heresy. Consequently, it is not widely realized that there are sufficiently convincing and reliable eye-witness reports on record to encourage cautious speculation that all of these species may actually have survived for quite a time *beyond* their official extinction dates (and in some cases may still exist today).

Passenger Pigeon

The most numerous species of wild bird ever known was the phenomenally plentiful passenger pigeon *Ectopistes migratorius*, a dainty, slender-bodied, long-tailed bird with blue-grey head, neck, back, and wings, and cinnamon-pink underparts. It has been estimated that during the nineteenth century's early years, its total population contained between five and ten thousand million birds. Or to put it another way, this single species may have accounted for as much as 45% of the entire bird population of America! One of the most evocative descriptions of its immense numbers during its heyday appeared in *The Mirror of Literature, Amusement, and Instruction* for 16 November 1822.

> The accounts of the enormous flocks in which the passenger, or wild pigeons, fly about in North America, seem to an European like the tales of Baron Munchausen; but the travellers are 'all in a story.' In Upper Canada, says Mr. Howison, in his entertaining '*Sketches*,' you may kill 20 or 30 at one shot, out of the masses which darken the air. And in the United States, according to Wilson, the ornithologist, they sometimes desolate and lay waste a tract of country 40 or 50 miles long, and 5 or 6 broad, by making it their breeding-place. While in the state of Ohio, Mr. Wilson saw a flock of these birds which extended, he judged, more than a

Passenger pigeon – did it survive beyond 1914?

> mile in breadth, and continued to pass over his head at the rate of one mile in a minute, during four hours – thus making its whole length about 240 miles. According to his moderate estimate, this flock contained two thousand two hundred and thirty millions, two hundred and seventy-two pigeons.

It seems inconceivable that less than a century after the above report had been published the passenger pigeon had been completely exterminated, but this is precisely what happened. As a result of an unutterably ruthless, relentless programme of persecution (on a scale unparalleled even in man's nefarious history of wildlife destruction), perpetrated by trigger-happy gun-toters attracted by the awesome spectacle of the birds' mass migrations, by 1 September 1914 only one solitary specimen remained alive. This was a 29-year-old hen bird named 'Martha Washington', exhibited at Cincinnati Zoo. And shortly after noon on that fateful September day, this last humble survivor of an ostensibly indomitable, indestructible species died. The unthinkable had happened – the passenger pigeon, whose vast migrating flocks had virtually eclipsed the sun in the time of the great American painter Audubon, was no more.

Officially, that is. For at least another decade, alleged sightings of passenger pigeons were frequently reported, but scientists tended to dismiss these as mistaken observations of the smaller but closely related mourning dove *Zenaida macroura*, still a common species. In September 1929, however, a remarkable report emerged that could not be discarded so readily. This was the month in which Michigan University bacteriologist Prof. Philip Hadley, in the company of a Mr Foard, an old friend familiar with the land, had been hunting in a virtually uninhabited wilderness nestling within Michigan's northern peninsula. They had been hunting there for some time when Foard drew Hadley's attention to a bird perched close by, and declared that it was a passenger pigeon – which he had observed in enormous numbers when younger. Needless to say, Hadley turned at once to spy this exceedingly unexpected specimen, but just as he caught sight of it the bird took flight. Nevertheless, it did seem to him to be pigeon-like in form, with a pointed tail, and he clearly believed the incident to be of significance, because he sent details to the eminent US journal *Science*, which in turn judged it to be important enough to warrant publication in its issue of 14 February 1930.

Within his letter, Hadley also referred to a couple of other recent sightings, documented a month earlier by Kendrick Kimball in the *Detroit News* (5 January). One of these sightings had been made on 10 June 1929, by Robert H. Wright of Munissing, Michigan. Wright was convinced that the pair of birds that he saw at close range on Highway M-28, about 16 miles from Munissing, were passenger pigeons. In the other sighting, made between Indianapolis and Kokomo while driving from Florida, Dr Samuel R. Landes spotted a flock of approximately fifteen birds that he readily identified as passenger pigeons. Both Wright and Landes were familiar with this species' appearance – like so many others, they had shot hundreds of them during the late 1870s.

Nonetheless, the last *confirmed* wild specimen was shot in 1899, at Babcock, Wisconsin, so is it really possible that the birds reported three decades later by the eyewitnesses above were truly passenger pigeons? It seems rather unlikely, at least at first, because after the last major flocks had been slaughtered (in 1878), stragglers did not survive long, and matings became ever fewer. It seemed as if the species could only persist and reproduce when present in huge flocks. At the same time of course, the familiarity of the eyewitnesses with the species makes their testimony all that more difficult to discount.

Perhaps certain fairly secluded localities did house a last few specimens, which existed undetected beyond the date of Martha's death, and possibly even mated every now and then, and which were encountered only when their flights traversed areas frequented by man, or when man occasionally passed by their hide-aways. Yet without the immense congregations necessary to provide the stimulus for normal, full-scale reproduction, they could surely do no more than extend their species' survival by a few years. Long before the last individual died, whether in 1914 or in the 1930s, the passenger pigeon's descent into extinction had already begun, irrevocably and inevitably, with the disappearance of its vast flocks. After that, it could only be a matter of time.

Surely, then, the 'passenger pigeon' spied in March 1965 at Homer, Michigan, by Irene Llewellyn (*Fate*, September 1965) and another spied the same year by Stella Fenell at New Jersey's Park Ridge (*Fate*, January 1966) were only mourning doves ... weren't they?

An Antipodean equivalent of sorts is the flock pigeon *Histriophaps histrionica*. In the 1800s huge flocks, containing millions of birds, lived on the grass plains of New South Wales and Queensland. Today, though, it is a relatively rare species (it was once thought to be extinct). This time the cause is not man himself but his animals: the flock pigeon is a seed-eater, but generations of grazing cattle and sheep have prevented the plains' grass from seeding adequately.

Carolina Parakeet

The Carolina parakeet *Conuropsis carolinensis*, a readily recognizable species with bright green body and striking yellow head, earned its own status as a 'classic' not just by being the only parrot species native to North America, but also because its extinction so closely paralleled the passenger pigeon's. Once very common in North America east of the Great Plains (especially in swampland areas), it acquired notoriety among fruit farmers as a considerable pest, because large flocks would descend upon orchards and devour great quantities of the farmers' valuable produce. This, together with its popularity among woodsmen as a shooting target, and as a pet (responsible for the trapping of great numbers), resulted in its rapid extermination. The last wild specimen known to have been collected was taken on 18 April 1901 in Florida, and by February 1918 only a single captive specimen remained. By an ironic coincidence, this last living individual, a male called 'Incas', was

housed at Cincinnati Zoo – which had already been home to the very last passenger pigeon – where he died later that month. Thus, in less than four years, this zoo had played host, reluctantly but impotently, to the extinction of two of North America's most distinguished species of bird.

Yet as with the passenger pigeon once again, reports of Carolina parakeets continued to surface for many years after their species' official extinction date. Some of these may well have been based upon sightings of non-native green parakeets that had escaped from captivity, but other, more compelling accounts are also on record. For example, in *Extinct and Vanishing Birds of the World* (2nd edn, 1967) James C. Greenway noted that in 1920 a flock of about thirty individuals was reported near Florida's Fort Drum Creek by Henry Redding, a local man. Equally remarkable (but in this case for all the *wrong* reasons) was a sighting made in 1926 by Charles E. Doe – at that time no less a personage than the Curator of Birds at Florida University. The presence in Okeechobee County, Florida, of three pairs of parakeets closely resembling the supposedly extinct Carolina parakeet evidently filled Doe with great excitement. So much so that, according to Errol Fuller (*Extinct Birds*, 1987), he proceeded to rob the poor birds of their eggs!

From carrying out extensive enquiries, esteemed American ornithologist Alexander Sprunt Jr became convinced that before the start of the Second World War in 1939, Carolina parakeets still survived within the Santee swamp area of South Carolina. One account that particularly impressed him had been obtained from a local woodsman named Shokes, who alleged that during the three to four years in which he and his son had been employed in that area as National Audubon Society bird wardens in the 1930s, they had seen green-bodied, yellow-headed parakeets there on three or four separate occasions. During one of these, Shokes had observed two such birds, evidently adults, followed by a smaller, younger individual with wavering flight, as they made their way across Wadmacaun Creek to Wadmacaun Island. Sprunt himself, conversely, never saw adult specimens but one day sometime between 1936 and 1938, whilst in the company of John Baker (then President of the National Audubon Society) and acclaimed ornithologist bird painter Roger Tory Peterson, he had seen a bright green bird fly swiftly past about 50 yards away, with a rapid, dove-like flight which convinced him that it was an immature Carolina parakeet. Sprunt sent news of his investigations to his English friend M.S. Curtler (*Animals*, 23 November 1965).

Sadly, even if the Santee Swamp birds were genuine Carolina parakeets, they could not have saved the species from extinction, because the swamp was eventually destroyed by developmental processes for a power plant. Nonetheless, there are many other swamps still existing within this bird's original range that remain aloof and little-explored even today, so that although unlikely, it is not impossible that some Carolina parakeets still linger undetected there, with any occasional sightings of them being discounted as nothing more exciting than non-native escapee species.

Pink-headed Duck

A similar situation applies relative to claims for the survival of the Indian pink-headed duck *Rhodonessa caryophyllacea*, the only species of duck to have not only a completely pink head but also a predominantly pink neck: cultivation of its swampland habitat and decimation by duckshooters are believed to be responsible for its extinction. The last definite record of a wild specimen is from 1935, with some captive individuals possibly surviving into the 1940s. In the *Journal of the Bombay Natural History Society* for 1960, however, K.L. Mehta, Deputy Game Warden of Himachal Pradesh, recorded that on 28 and 29 February of that year, along with his friend Shri Grehawal, he spied a drake of this species in a local tank in Kunihar State, about 40 miles south of Simla. They even attempted to take a photograph of this highly significant specimen, but were foiled by the profusion of reeds all around, and the lack of a hide in which to approach close enough. Six years later the same journal carried another report, this time by Laliteshwar Prasad Singh, documenting his shooting of a pink-head on 27 January 1947 at Manroopa Lake, in Bihar's Monghyr District. Singh also noted that he saw five to eight individuals there in 1948–9, but did not shoot any during that period. And in February 1974, *Oryx* provided a short report noting a putative pink-head sighting in Nepal.

Sceptics, however, believe such reports as these to be based upon misidentified red-crested pochards *Netta rufina*, or even spotbill ducks *Anas poecilorhyncha* (*Oryx*, 1974). Yet how likely is it that experienced wildlife observers such as game wardens and hunters could readily mistake a member of one of these very common, familiar species with as renowned a *rara avis* (literally) as the pink-headed duck. Also, there are many potential hide-aways for this bird within the borderlands between Nepal and India that cannot be explored due to periodic outbreaks of warfare, so there is still reason for hope that this very striking species of waterfowl will one day be rediscovered.

New Zealand's Moas

In New Zealand, there seems little hope that any of the famous ostrich-like moas of the genus *Dinornis* ('terrible bird') still survive, but it may still be premature to claim the same for at least one of their less familiar, smaller relatives. Apparently an inhabitant primarily of subalpine shrubland and montane forests, the upland moa *Megalapteryx didinus* is not generally assumed to have survived beyond the 1840s; some consider that even this extinction date is too recent. One of the most thought-provoking reports casting doubt upon such claims, however, is contained within Alice McKenzie's *Pioneers of Martins Bay* (revised 1952). In it, she recalled her encounter in 1880 as a 7-year-old child at Martins Bay, South Island, with a strange bird that cannot be conclusively identified with any known species alive today. Able to walk straight up to it, she described it as a large bird at least 3 ft high, with navy-blue plumage, dark green legs with large scales, no

Kiwis and giant moa – is the 'giant kiwi' a miniature moa?

noticeable tail, and three large claws on each foot. She endeavoured to capture it, and in response it attempted to attack her, so she ran home. When she returned to the spot with her father, the bird was gone, but its three-toed tracks remained. Using a measuring ruler, her father found that the middle toe measured 11 in from heel to tip, though the soft sand may have enlarged it a little.

In 1889, she saw the bird again, and her brother spotted it once too. After the rediscovery in December 1948 of another supposedly extinct South Island bird, the famous flightless rail known as the takahe *Notornis mantelli*, Alice McKenzie examined a preserved specimen, because its dark blue plumage suggested the possibility that the bird which she and her brother had seen may have been a takahe. After examining one, however, she discounted this, stating that the takahe seemed totally different in appearance, noting in particular that its legs were deep red, not green. Could Alice McKenzie's mystery bird have been a living *Megalapteryx*? Some ornithologists are optimistic that it was; others consider it to have been a takahe after all.

During February and March 1978, the latest in a long line of modern-day moa hunts took place. Led by biologist Prof. Shoichi Hollie of Japan's Gunma University and accompanied by Seido Hino (Director of Japan's Nippon Television), a Japanese team of scientists converged upon South Island's Fjordland, armed with a very sophisticated lure – a reconstituted moa cry on tape, created with the aid of computerized analyses of *Megalapteryx* throat structure using fossil remains. Tragically, however, as Prof. Hollie subsequently informed me, it failed to elicit any reply, and he now considers *Megalapteryx* to be extinct. This is also the opinion of Ron Scarlett, the Canterbury Museum osteologist with whom the team consulted upon arrival in New Zealand.

Much of the *Megalapteryx* mystique and the continuing hope that it will eventually be discovered alive stems from another avian mystery. According to Dr Bernard Heuvelmans in *On the Track of Unknown Animals* (1958), the Maoris tell of an unidentified form of 'giant kiwi', termed *roa-roa*, said to be the size of a turkey, and armed with sharp spurs on its feet. However, as I discovered from Ron Scarlett and from a number of works dealing with New Zealand's avifauna, *roa-roa* is actually the name given to the largest of the *known* kiwis, namely the great-spotted kiwi *Apteryx haasti* of South Island. Even so, *A. haasti* never exceeds 2 ft in total length, and does not have spurs – but the small moas did, and it so happens that *Megalapteryx* was indeed turkey-sized! Moreover, it is very possible that in life, this little moa superficially resembled an extra-large kiwi – its scientific name actually means 'big kiwi'. In short, this suggests that the reclusive 'giant kiwi' is separate from *A. haasti* (the genuine *roa-roa*), but may be one and the same as *Megalapteryx*!

Great Auk

On 19 April 1986 the London *Daily Telegraph* carried the remarkable

Great auk – when did it really die out?

news that an expedition was to set sail for Papa Westray, a tiny islet in the Orkneys, in response to reputed sightings of a living great auk *Alca impennis*, the famous flightless, penguin-like seabird supposedly exterminated in 1844. Unhappily, as documented in a later *ISC Newsletter* (spring 1987), it proved to be more of a canard than an auk! Nothing more, in fact, than an imaginative advertising promotion for a certain brand of whisky. This is not the first false alarm for this species. Reports of great auks in the Lofoten Islands, off the Norwegian coast, emerged every so often during the 1920s and 1930s; when investigated, the birds proved to be genuine penguins, brought from Antarctica as pets by whalers and released on the Lofotens when no longer wanted.

Nevertheless there are a number of more promising reports of post-1844 survival too. Many of these are buried in Norwegian journals and newspapers, but a good example from an English publication was contained in Dr Isaac J. Hayes's *The Land of Desolation* (1871), which describes his adventures in Greenland during summer 1869. The auk-related account concerns a conversation that Hayes had with a naturalist called Hansen.

> The great auk, long since supposed to be entirely extinct, he told me had been recently seen on one of the Whale-fish Islands. Two years before [in 1867] one had been actually captured by a native, who, being very hungry, and wholly ignorant of the great value of the prize he had secured, proceeded at once to eat it, much to the disgust of Mr. Hansen, who did not learn of it until too late to come to the rescue. How little the poor savage thought of the great fortune he had just missed by hastily indulging his appetite!

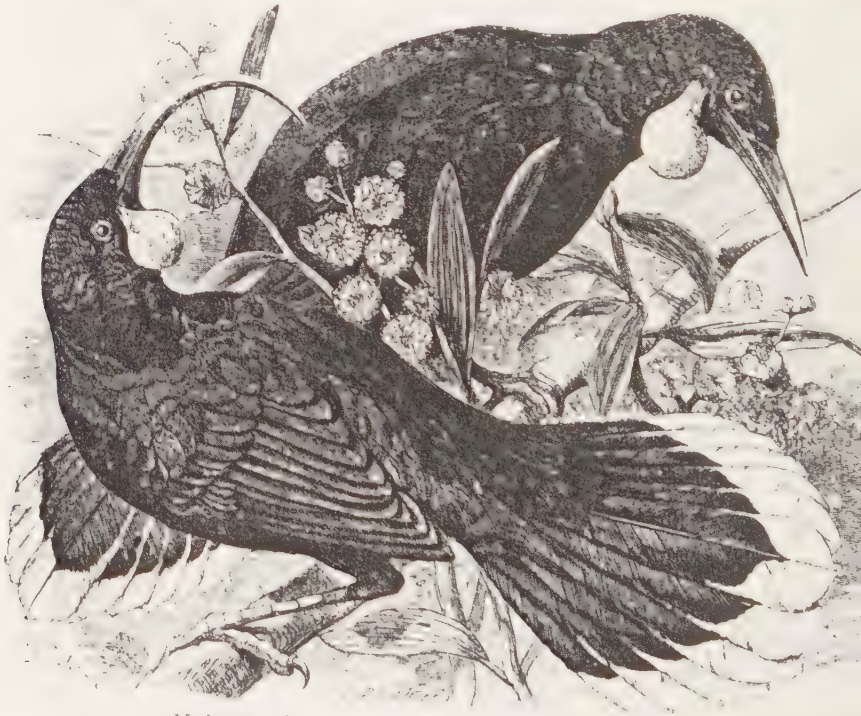
Huia

Deriving its name from its distinctive melodious call, the huia *Heteralocha acutirostris* was a member of a small family of birds found only in New Zealand and referred to as wattlebirds. A crow-sized species whose glossy black plumage disclosed a deep green sheen when viewed at certain angles in sunlight, it was instantly characterized by its pair of bright orange facial wattles, its elegant tail plumes with broad tips decorated by a wide band of sparkling white (tinged with rufous in young birds), and – above all else – by the truly exceptional, extraordinary nature of its ivory-coloured bill, for unlike all other birds the huia had not one bill but two.

Whereas the male's was short and straight, used for chiselling out grubs (especially those of *Prionoplus reticularis*, a longhorn beetle commonly called the huhu) from decayed wood as a woodpecker does, the female's was long and curved gracefully downward, enabling her to secure grubs from deep woody crevices that her mate's short bill could not reach. Many animal species exhibit some degree of sexual dimorphism (see p. 58), but in birds this usually involves plumage or body size. The huia's drastic departure from that tradition, by uniquely possessing a sexually dimorphic beak, established it as a species of immense scientific worth, which made its extinction all the more tragic.

Never the most common of birds, the huia inhabited beech and podocarp forests, and was apparently confined to North Island's Ruahine, Tararua, Rimutaka, and Kaimanawa mountain ranges, with occasional reports from the Wairarapa Valley too. (Supposed sightings of huias from the woody country near Massacre Bay in South Island's Province of Nelson were never substantiated.) Yet although it had been hunted for generations by the Maoris, who greatly prized its attractive tail feathers for their chiefs' head-dresses, its numbers seemingly did not suffer unduly until the coming of the Europeans. Their arrival, though, saw the accompanying introduction of Western species that endangered the huia by preying upon it, competing with it for food, and exposing it to various diseases hitherto unknown there; large-scale procurement of huia specimens for museums and private collections; destruction of its forest homelands for cultivation and grazing; and ultimately the widespread wearing of huia plumes by *all* Maoris (regardless of status) and by members of European high society. There could be only one outcome. The last fully verified sighting of this species was made on 28 December 1907, when W.W. Smith spotted two males and a female. Since then, the huia has been classed as extinct.

The huia's morphology is unique. No other bird in New Zealand, whether native or introduced, can be readily confused with it – which is



Huias – male with straight bill, female with curved bill

why the sizeable number of alleged *post*-1907 huia sightings has attracted notable scientific interest. Their most detailed documentation is presented in William J. Phillipps's *The Book of the Huia* (1963). A noted expert on New Zealand's avifauna, Phillipps listed twenty-three such sightings, and learnt that as recently as the 1920s eye-witness reports of black birds with orange wattles and white-tipped tails regularly emerged from the huia's former haunts. Although none were by professional ornithologists, a number are sufficiently convincing to give cautious cause for optimism that this unmistakeable species still survived at that time. An official huia search was carried out in 1924, and although no huias were seen, signs of their existence were observed. Moreover, a much more recent event, one that greatly impressed Phillipps, occurred on 12 October 1961, featuring Margaret Hutchinson.

As I learnt from Ron Scarlett of South Island's Canterbury Museum, when Hutchinson arrived for a six-month stay in New Zealand in 1961 she visited the museum first of all, before travelling on to North Island; she interviewed at length its then Assistant Director, Graham Turbott, regarding the huia, as she seemed most interested in this species. After reaching North Island, she spent October at the Lake House Hotel, Waikaremoana, in the Urewera State Forest, where she was studying the native bush (forest). On 12 October, she spent the day at a smaller lake called Waikareiti, three miles further on from her hotel, and set amidst New Zealand beech woodland. She had been sitting by the track leading to the lake, watching some large, red-and-green native parrots called kakas pecking dead wood off a tree, when suddenly, as she was looking across a small valley nearby, she saw a bird fly up the middle of it, and disappear into some beeches. It was of similar size to the kaka (17–19 in) but was of slighter build, and its plumage was black, except for the white-banded tip of its tail. In the field-guide that she later consulted, the picture most closely matching her bird was the huia's.

As she noted in an article published in the RSPB's *Birds* magazine (September–October 1970), she recounted her sighting not only to William Phillipps but also to Dr R.A. Falla (then Director of Wellington's Dominion Museum), another major authority on New Zealand birds. Both men were sufficiently impressed to deem it likely that she had genuinely seen a huia; in his *The Book of the Huia*, Phillipps goes so far as to conclude: ' ... there appears to be little doubt she did see a huia.'

However, we must also consider the possibility that her evident interest in this species may have actually conspired against her. Could a combination of excitement and surprise at the bird's brief and unexpected debut have 'transformed' it (completely unconsciously) in her eyes from its true identity (some still-surviving species) into a huia? In short, could her huia have been an illusion, created unconsciously by an innate desire to see one? The human brain can play some quite extraordinary tricks on our eyes, often 'filling in' details that are not actually there, or modifying the appearance of an object to accord with some subconscious thought or memory – and all without the person

concerned even realizing what is happening.

If the huia really does still survive, why has it not been formally rediscovered by now? In a foreword to Phillipps's book, Falla noted that even at best, New Zealand's bush is not overly conducive to easy birdwatching, requiring such a sustained effort to explore the multitude of potential hide-aways for birds that there is rarely enough time to carry out detailed observations at any one given spot, so that all-too-many of its birds are not sighted at all. If the huia *is* alive, it has probably retreated into areas that even by the bush's standards are quite inaccessible, and thus less readily disturbed.

Indeed, over the years a number of people have informed Ron Scarlett of possible huia sightings in the remoter regions of the Kaimanawa range, so that he deems it possible that the species still survives here. Moreover, as Hutchinson revealed in her article, careful analysis of the *post*-1907 reports documented by Phillipps do seem to indicate a movement northwards – away from the huia's most favoured former provenance, the Tarawera Range (now divided up by agricultural cultivation), and into a wilder, mountainous forest region (far less accessible to man), perhaps as far as the Urewera State Forest after all. Equally, Ron Scarlett has identified subfossil huia bones from moa-hunter middens on the Taranaki coast, and from limestone caves in the Mahoenui area, lying on the border of North Taranaki and South Auckland, and much further north than the huia's known modern-day distribution. Could this region's more remote portions be another putative retreat of surviving huias? Perhaps some huias took refuge in certain northern areas less readily reached by man during their species' last stand in its favoured territory; in addition, there might be areas that have always housed a resident huia population, wholly unknown to the Europeans, so that this truly unique species – New Zealand's handsome and quite astonishing bird with two beaks – still survives after all.

Dodo

Lastly, but by no means least, not even that most inviolate of all extinction dates – 1681 for Mauritius's bizarre flightless pigeon, the dodo *Raphus cucullatus* – is beyond the reach of reassessment, as I noted in a recent article on this subject (*Fate*, May 1989), at least as far as explorer Lawrence Green was concerned. In *Secret Africa* (1936), the following lines offer tantalizing hope that the dodo survived well beyond 1681:

> But is the dodo dead? I have looked upon the bones of the dodo in the museum at Port Louis, Mauritius, and I have heard the island people talk of the bird. Now these people living in the very home of the dodo never speak of it as extinct. They will tell you that the dodo has been seen many times since 1681 – the year in which the last dodo was supposed to have died. They declare, in fact, that the dodo still lives in remote parts of the island, in inaccessible cliff caves and mountain forests.

Justification for rewording 'as dead as the dodo' to 'how dead is the dodo?', perhaps?

11 *Gliding Frogs, Parachuting Palm Civets, and Flying Gurnards*

Volare qui potest, ne serpat. [He who can fly, let him not creep.]
Pontanus, *Collectio Proverbiorum*

Sine pennis volare hau facilest; meae alea pennas non habent.
[Flying without feathers is not easy; my wings have no feathers.]
Plautus, *Poenulus*

Among modern-day animals, the birds, bats, and winged insects are capable of true flight. In addition, there are many species capable of gliding, using specialized membranes or other modifications for short-term aerial activity. Almost invariably, if inappropriately, labelled in popular parlance with the adjective 'flying' rather than 'gliding', these latter include such creatures as the flying scalytails (see p. 180), flying 'lemurs', flying squirrels and flying phalangers, flying snakes, flying geckos and flying 'dragons', flying fishes, flying crustaceans (various *Pontellina* copepods), and flying squids. Furthermore, there are certain others whose airborne abilities have attracted appreciable controversy over the years, as now revealed.

Gliding Frogs

These extraordinary little amphibians were first brought to widespread Western attention by Alfred Russell Wallace, the great traveller and co-proponent (with Darwin) of the theory of evolution, during his detailed explorations and researches in south-east Asia. In his book *The Malay Archipelago* (1869), he described his first encounter with one of these fascinating frogs (destined to be named *Rhacophorus nigropalmatus*) as follows:

> One of the most curious and interesting reptiles [in those days, amphibians were classed as reptiles] which I met with in Borneo was a large tree-frog, which was brought me by one of the Chinese workmen. He assured me that he had seen it come down, in a slanting direction, from a high tree, as if it flew. On examining it, I found the toes very long and fully webbed to their very extremity, so that when expanded they offered a surface much larger than that of the body. The forelegs were also bordered by a membrane, and the body was capable of considerable inflation. The back and limbs were of a very deep shining green colour,

the under surface and the inner toes yellow, while the webs were black, rayed with yellow. The body was about four inches long, while the webs of each hind foot, when fully expanded, covered a surface of four square inches, and the webs of all the feet together about twelve square inches. As the extremities of the toes have dilated discs for adhesion, showing the creature to be a true tree-frog, it is difficult to imagine that this immense membrane of the toes can be for the purpose of swimming only, and the account of the Chinaman, that it flew down from the tree, becomes more credible.

Gliding frog – an aerial amphibian

This is, I believe, the first instance known of a 'flying frog' and it is very interesting to Darwinians as showing that the variability of the toes which have been already modified for purposes of swimming and adhesive climbing, have been taken advantage of to enable an allied species to pass through the air like the flying lizard [*Draco*]. It would appear to be a new species of the genus Rhacophorus, which consists of several frogs of a much smaller size than this, and having the webs of the toes less developed.

Clearly, there was no doubt in Wallace's mind that this 'flying frog' was able to become airborne, and his description was initially received by the scientific world with great interest. Unfortunately, Wallace's enthusiasm concerning his remarkable herpetological discovery got the better of him. In attempting to demonstrate, by calculations based upon

the total area of the frog's membranes when fully expanded, that these membranes collectively afforded a sufficient surface area for the frog to succeed in gliding, Wallace made a mistake in his arithmetic. By now, some authorities had already begun to disbelieve that such frogs genuinely exhibited any aerial ability, and these eagerly seized upon Wallace's mathematical faux pas to reinforce their case – rather than choosing to carry out the necessary calculations for themselves (which, when computed correctly, *still* gave a surface area capable of sustaining short-term gliding).

Accordingly, the gliding frog's aeronautical claim to fame was unceremoniously discredited, and as little attempt was made to re-examine its case in the field, *R. nigropalmatus* remained grounded (at least in the scientific texts) for many years thereafter. Its first vindication came in 1926, when H.B. Cott showed that even a certain Brazilian tree frog called *Hyla venulosa*, which has far less webbing between its toes than *R. nigropalmatus*, still dropped to the ground only very slowly, and at a gradient of about 60°, thus landing at quite a distance away from its descent's starting point. This is because its limbs were outstretched laterally during its descent, thereby preventing it from turning somersaults; this would be improved upon by *R. nigropalmatus*, whose toe webs would act as miniature parachutes. From that important discovery, it was only a matter of time before the case of *R. nigropalmatus* itself was reassessed. And in the late 1950s, this species was studied and filmed in Borneo by Prof. John Hendrickson, who was able to show that, just as Cott had predicted, *R. nigropalmatus* is a competent parachutist, descending in a stable manner at a gradient of approximately 60° – observations that fully confirmed Wallace's expectations, with some individuals sustaining glides of up to 40 ft from their original tree-trunk launching pads.

Although it is still the most famous, Wallace's *R. nigropalmatus* is no longer the only species of gliding frog known to science. Southern China's Mount Omei is home to *R. omeimontis*, Japan has *R. schlegelii*, and others include *R. reticulatis* in Sri Lanka, *R. prominanus* in Thailand, and Malaysia's *R. reinwardtii*. A particularly notable species is *R. dennysi* of Malaysia and southern China, said to be capable of gliding up to three times as far as Wallace's *R. nigropalmatus*, and reverently worshipped as a god by some of its human neighbours, who carry it in a regal procession upon its own sacred chair on certain holy days, the chair deftly bound with flowers in a manner designed to secure the frog in place so that it cannot leap or glide away, but without harming it.

In view of this frog's important standing in the religion of these people, it is a great pity that the gliding frog sceptics of the past did not think to consult them regarding the question of whether such amphibians were truly able to glide through the air; the dispute could have been conclusively resolved in this way long ago. Sadly, however, some scientists seem to ignore, almost as a matter of course, anything that 'uneducated' native people tell them – smugly preferring to believe that these people have never acquired even the tiniest amount of knowledge concerning any of the animals whose world they have

shared intimately for countless generations.

Parachuting Palm Civets

Resembling a portly, round-headed genet with very dense, woolly brown fur dappled with small black spots, and an extremely long, barred tail, but without any form of gliding membrane or other device for achieving aeronautical success, the arboreal, 3-to-4-ft-long nandinia or African palm civet *Nandinia binotata* is the most unexpected and least known of all mammals with gliding prowess. Indeed, I learnt of its surprising abilities quite by accident myself. While flipping through some *African Wild Life* issues from 1958 in search of an account on a totally different subject, serendipity brought to my attention a fascinating letter by G.V. Thorneycroft.

In it, Thorneycroft recalled seeing two nandinias high up in a tree one morning on his farm at Zomba, Nyasaland (now Malawi). One became frightened by his dogs, standing at the foot of the tree barking loudly, and as a result it chose to exit the tree in a quite astonishing manner. As noted by Thorneycroft, the nandinia,

> ... made a leap from a high branch and volplaned to the ground with legs and tail outstretched. It made a perfect landing on the bare ground, ran to another tree from which it again volplaned and repeated the action.

The mechanism responsible for this highly unexpected capability from as bulky and unlikely a gliding animal as a palm civet is a somewhat familiar one.

> What struck me was the graceful way it planed or almost floated to the ground at an angle greater than half a right-angle so that it landed at a considerable distance from the tree it was in. Its tail was extended straight

Nandinia – a parachuting palm civet

behind, the long hair at the base seeming to be 'on end' and its legs stretched out as far as possible. On each occasion it made a perfect four-point landing.

In short, the nandinia provided a surprising but nonetheless wholly corresponding verification of Cott's findings with gliding frogs back in 1926, unequivocally underlining the importance of a fully outstretched body and limbs (with or without the possession of a gliding membrane) for successful aerial accomplishment.

Flying Gurnards

Flying gurnards are extremely distinctive in appearance, and exceptionally difficult to classify. The 1-ft-long Atlantic *Dactylopterus volitans* and the comparably sized Indo-Pacific *Daicocus peterseni* are among the most familiar representatives of these curious fishes – variously categorized with the true gurnards, the sea-robins, and the sea-horses, but nowadays generally assigned an order of their own. Superficially similar to true gurnards but distinguished anatomically by subtle differences in the arrangement of their head bones and the spines of their pectoral fins, the bottom-dwelling (benthic) flying gurnards are characterised by their large, bulky heads encased in hard bone; their brightly coloured box-shaped bodies, dappled with multi-hued spots; and, above all else, by the enormously enlarged pectoral fins of the adults, expanded like giant, heavily ribbed fans, and responsible for the age-old dispute regarding their out-of-water activity.

Records dating back as far as Greek and Roman times tell of how these attractive fishes are able to launch themselves out of the water and glide over the surface for a notable distance, just like the better known 'flying fishes' (*Exocoetus* species), before plunging back down into the sea again, and even compared their gliding with that of swallows. According to early authorities such as Salvianus, Belon, and Rondelet, the reason for this behaviour was to escape predators in the water (even though by leaping out of it they surely exposed themselves to the danger of being swooped upon by gulls and other seabirds), but whatever the *reason* for gliding, for a long time there seemed no reason to doubt that they *did* glide. There are numerous reports on record from schooners and other ocean-going vessels, recounting the impressive sight of whole schools of these colourful sea creatures suddenly breaking through the surface of the sea and gliding for up to 300 ft or more on their varicoloured outstretched pectorals, before sinking back beneath the waves, only to be replaced by a second school, and then by a third, and so on, in a breathtaking display of piscean aerobatics.

One of the chief reasons for subsequent scepticism arose from a grave error by naturalist H.N. Moseley and fellow researchers aboard the late-nineteenth century research vessel *Challenger*. Their reports testified to the frequent occurrence of schools of flying gurnards rising up out of the water and gliding past on wing-like pectorals; tragically,

Flying gurnards – can they really glide through the air?

however, it was later shown that they had misidentified these fishes. Instead of flying gurnards, they had been the true *Exocoetus* flying fishes! Naturally, this did not help the flying gurnard's case, having much the same damaging effect upon the credibility of its gliding prowess as Wallace's arithmetical error had upon that of his gliding frog. Since then, the general consensus has been that flying gurnards are too heavy and cumbersome even to lift themselves up out of the water, much less to soar above it. Not everyone, however, is convinced by this.

During communications with distinguished ichthyologist Dr Humphrey Greenwood, I learnt that he once saw a single flying gurnard (probably a *Dactyloptena orientalis*) glide up out of the disturbed waters at the bows of a small tug moving slowly in shallow water (about 10 ft deep) off the Indo-Pacific island of Inhaca, in Maputo Bay. Dr Greenwood stressed that when the fish emerged, it did become airborne, and that its passage through the air seemed to be supported by its spread pectoral fins (spanning roughly 8 in). The movement genuinely appeared to be a controlled glide, tracing more of a gentle parabola than the sharp, uncontrolled, haphazard leap out of and back into the water that many authorities consider to be the very most that could be expected of such fishes, especially benthic types like the flying gurnards. Greenwood believes that the reason for his fish's uncharacteristic occurrence in shallow water was most likely disturbance by the noisy, water-displacing passage of the tug, the fish ascending to the sea's surface as an escape response.

By coincidence, Dr Greenwood has also provided some support for the alleged aerial abilities of another controversial fish – *Pantodon buchholzi*, the strange, freshwater butterfly fish of tropical West Africa, first discovered in 1876 and seemingly related most closely to the bonytongues (see p. 60). Its pectoral fins have some thin, stilt-like rays, which enable it to 'stand' on the sea bottom, but in overall shape they are very large and wing-like, just like the flying gurnards'. However, there are reports that *Pantodon* can not only achieve controlled gliding but also undertake true flight – powered by deliberate flapping of its pectoral fins. Although science was willing to accept (in this instance) that it could glide, flapping flight was disbelieved – even though it is well-documented for the tiny freshwater hatchetfishes or gasteropelecids of South America.

Then Drs Greenwood and K.S. Thomson carried out a detailed anatomical study of *Pantodon*, and discovered to their great surprise that its shoulder girdle's structure, and the arrangement of muscles linking it with the pectorals, closely compared to the corresponding anatomy of flying birds. Moreover, unlike those of other fishes, the pectorals of *Pantodon* could not be flattened against its body, but remained permanently extended at right angles, and could indeed be flapped up and down (*PZSL*, 1960). Thus, although there is still no conclusive evidence that it *does* fly (as well as glide), its anatomy implies that it *could*, if the need to do so ever arose.

Correspondingly, it seems reasonable to assume that although the

flying gurnards' lifestyle is one that does not normally involve gliding, their pectoral fins can sustain it if some exceptional circumstance should arise to warrant such activity – but until precisely monitored (preferably filmed) observations of flying gurnards engaged in purposeful gliding are (if ever) obtained, it is likely that their aerial capability will continue to be dismissed as, in the most literal sense, a pure flight of fancy.

12 *Count Branicki's 'Terrible Mouse', and Other Giant Rodents*

> 'Matilda Briggs was not the name of a young woman, Watson,' said Holmes, in a reminiscent voice. 'It was a ship which is associated with the giant rat of Sumatra, a story for which the world is not yet prepared ...'
>
> Sir Arthur Conan Doyle,
> 'The Adventure of the Sussex Vampire',
> from *The Case-book of Sherlock Holmes*

Prof. Constantin Jelski, Curator of Cracow Museum, was certainly not prepared for the creature that he encountered one morning in 1873, wandering through the orchard of a hacienda garden near Vitoc, in the eastern Peruvian Andes. Although it was superficially mouse-like, this animal differed very dramatically from all the mice that Jelski had ever seen before – with a total length of 3 ft, it was much the same size as a fox terrier! That extraordinary beast, destined to become one of zoology's greatest enigmas, is just one of the unexpectedly large but little-known rodents in this 'Gnawers of Note' chapter.

Count Branicki's 'Terrible Mouse'

Prof. Jelski's find was unlike any species known to him, so he felt compelled to collect it for identification. The beast proved quite ferocious – at least according to the report received back home in Poland by Jelski's sponsor, nobleman Count Grafen Constantin Branicki. Hence, when formally described later in 1873 by Dr Wilhelm Peters, Berlin Museum's director, this important new species was christened *Dinomys branickii* – 'Branicki's terrible mouse'. However, this turned out to be a complete misnomer.

First and foremost, it was not a true mouse. Indeed, the question of just *what* it was proved to be quite problematical, because it seemed to combine the morphological characteristics of several different rodent families. Its black pelage handsomely marked with horizontal rows of white spots, and its limb structure, compared closely with those of another large South American rodent, called the paca – indeed, one of its native names, pacarana, translates as 'false paca', and this is the name by which it is most commonly referred to in English (a less frequently used name is *rukupi*). In contrast, certain of its cranial and skeletal attributes, plus its long tail (a most *un*-paca-like feature) more

Pacarana – depicted in error as a ferocious creature

closely corresponded with the West Indian hutias (relatives of the coypu); whereas its molar teeth were more reminiscent of a chinchilla's; and various other aspects seemed to ally it with the capybara. Faced with such an anatomical anomaly, Peters placed the pacarana in a completely separate family, all to itself.

Naturally, the scientific world was extremely curious about this highly significant species, the third largest rodent in the world, and became ever more curious as the decades rolled by – because for thirty-one years no further pacaranas were reported. Then in June 1904, two living specimens of this seemingly lost species were received by Dr Emil Goeldi, Director of Brazil's Para (Belem) Museum. In contrast to the graphic reports concerning the Vitoc individual, these two, an adult female and a subadult male sent in a cage from Brazil's upper Rio Purus, proved to be the most docile, inoffensive animals imaginable, the very antithesis of their 'terrible mouse' title.

Since then, further specimens have been obtained, but the number of live examples recorded is still extremely small – it is perfectly true to say

that despite its very noticeable size and its taxonomically prestigious status as the only living member of an entire rodent family, the pacarana remains one of the world's least-known mammals. It is generally classed as an endangered species, but whether it really is rare, or simply very elusive, is difficult to say. It has been written off many times as extinct, only to reappear without warning, to the delight and relief of mammalogists everywhere.

Consequently, zoos prize pacaranas almost as much as giant pandas – which is why early 1947 was a singularly memorable time for Philadelphia Zoo. It was then that it received an innocuous-looking crate from animal dealer Warren Buck of Camden, New Jersey, with the remark, 'Here's a new one on me. Maybe you know what it is.' When the crate was opened, to everyone astonishment it contained a living pacarana! And just like Goeldi's twosome, it proved to be delightfully tame and affectionate, showing no inclination to bite, and liking nothing better than to greet its visitors with a cheerful grunt and to sit upright on its hindlegs crunching a potato or carrot gripped firmly between its forepaws (*Fauna*, March 1947). Of the handful of captive pacaranas obtained more recently and exhibited at such zoos as Zurich's (the first to breed them) and Basle's, most have been of similarly pacific temperament, actively seeking out their human visitors to nuzzle them and rub themselves against their legs almost like cats, or even to be picked up and carried just like playful puppies – truly a species with no desire whatsoever to live up to its formidable *Dinomys* designation!

Quemi – Forgotten for Three Hundred Years

Not so long ago, a close relative of the pacarana also existed. In his sixteenth century account of the West Indian island of Hispaniola (comprising Haiti and the Dominican Republic), explorer Ganzalo Fernández de Oviedo y Valdés mentioned a mysterious rodent that he called the quemi, which was said to be brown in colour like the island's hutias, but larger in size. It was apparently a traditional item of food for the Hispaniolan natives, but after Oviedo's report nothing further was heard of it. Then in the 1920s, bones of a pacarana-like rodent were discovered in a cave near a plantation at St Michel, Haiti. After studying them, Dr Gerrit Miller of the Smithsonian Institute identified their owner as a representative of Oviedo's obscure quemi, and in 1929, within his formal description of the bones, Miller named their species *Quemisia gravis*. It seems that the quemi died out soon after the arrival on Hispaniola of the Spaniards, and certainly no later than the sixteenth century's close.

Amblyrhiza inundata – a Veritable Rodent Colossus

An additional pacarana relative once inhabiting the West Indies was *Amblyrhiza inundata*, whose remains have been discovered on the Antillean islands of Anguilla and St Martin. This rodent would have

been a daunting sight to behold – truly a terrible mouse to end all terrible mice – for it was almost as large as an American black bear! Nowadays, however, the awesome *Amblyrhiza* is no cause for alarm, because it died out some time even before the quemi, possibly even before man first reached its island homes.

Despite this species' impressive nature, its first recorded remains came to light in a distinctly prosaic, unimpressive manner – discovered in a shipment of phosphatic cave earth sent from Anguilla to Philadelphia as a potential fertilizer. These were passed to celebrated palaeontologist Prof. Edward Drinker Cope, who later obtained further remains after requesting Dr H.E. van Rijgersma, colonial physician of neighbouring St Martin, to visit Anguilla and secure whatever *Amblyrhiza* specimens he could obtain. At a meeting of the Philadelphia Academy of Natural Sciences on 1 December 1864, Cope formally named and described this species, but since then few *Amblyrhiza* remains have been found. However, in 1988 Donald McFarlane and Ross D.E. MacPhee undertook extensive fieldwork in certain Anguillan caves that seemed potential sources of further material; in one, Pitch Apple Hole, they discovered *Amblyrhiza* bones widely distributed in its floor's earth, from a depth of 1 in to around 16 in (*Cave Science*, April 1989). Their resulting collection of material, donated to the Anguillan Archaeological and Historical Society, is the largest ever made of this extraordinary lost giant among rodents. (Yet a South American Pliocene pacarana, *Telicomys*, was even bigger. The largest rodent ever known to have existed, it attained the size of a small rhinoceros.)

In addition to the quemi and *Amblyrhiza*, the West Indies also once housed some large, long-tailed rodents called giant rice rats or megalomyids ('big mice'). Handsomely coloured species with glossy black or dark-brown upperparts boldly contrasting their pure-white underparts and chin, at least three – namely *Megalomys desmarestii* from Martinique, *M. luciae* from St Lucia, and *M. audreyae* from Barbuda – survived into historic times. The extinction of *M. desmarestii* probably occurred as recently as 1902, with the eruption of Martinique's mighty volcano Mount Pelee. This was also the largest species; its head-and-body length was about 14½ in, and its tail around 13 in.

Giant Beavers, and the Only Rodents with Horns

During the Pleistocene epoch, beginning 2 million years ago and ending 10,000 years ago, the beavers of North America spawned some enormous species, belonging to the genus *Castoroides*, the largest of which rivalled *Amblyrhiza* by attaining bear-sized dimensions, measuring up to 10 ft long, including a hefty 3 ft tail (which appears to have been round, rather than flat). If they had been dam builders like their more modest-sized, modern-day counterparts, the resulting edifices would have been truly gargantuan, but it is not generally believed that these Brobdingnagian beavers felled trees; instead, their extensively webbed feet and short limbs indicate a greater emphasis upon aquatic activity. The giant beavers are assumed to have died out

shortly after the Pleistocene's close, never to be seen by man. However, in a fascinating *Ethnohistory* paper, Vermont researcher Jane C. Beck postulated in 1972 that the well-documented giant beaver legend encapsulated within the mythology of several tribes of north-eastern Algonkian Indian may be more than just a wholly fictional folktale, instead comprising a prehistoric memory of the extinct Ohio giant beaver *Castoroides ohioensis*.

More astonishing even than bear-sized beavers were the mylagaulids, uniquely distinguished from all other rodents, fossil or modern-day, by bearing a pair of short, pointed horns on their head. These bizarre animals, otherwise resembling bulky gophers the size of present-day beavers, existed in North America from the early Miocene to the mid-Pliocene (i.e. 24–3·2 million years ago), and included such genera as *Ceratogaulus*, *Mylagaulus*, and *Epigaulus*. Judging from their other noticeable characteristic – very long and powerful, flattened claws on their forepaws – the mylagaulids were probably gopher-like in behaviour too, spending their days burrowing (also indicated by their tiny eyes). But why should they require horns? It was once thought that they performed some function in the excavation of remarkable spiral-shaped burrows nicknamed 'devil's corkscrews', often discovered in fossilized form in Nebraska. However, these are now known to have been made by a fossil beaver, *Palaeocastor*, so the mystery of the mylagaulids' horns remains unresolved. These rodents' nearest modern-day relative, a non-horned species, is the mountain beaver *Aplodontia rufa*, a peculiar, primitive form most famous for being neither a mountain-dweller nor a beaver, and for being host to *Hystrichopsulla schefferi*, the world's largest species of flea.

Maned Rat – Ensures its Safety by Skunk Impersonation

Returning home to Europe in 1866 after spending some time on the Mascarene island of Reunion, traveller M. Imhaus stopped off at Aden for a few hours. While there he met a man with a most interesting pet – a large rodent of very distinctive appearance, belonging to a species completely unknown to science. Of stout build with small head and short limbs but long bushy tail, it was principally blackish-brown in colour, but its forehead and the tip of its tail were white, and its flanks each bore a lengthy horizontal strip of pale brown, edged with white and with a white stripe running along its centre. This strip was separated by a type of furrow from the notably long dark hairs borne upon the middle of the animal's back, and also upon its tail, which were erectile, capable of yielding a very odd-looking mane or crest.

Imhaus bought the man's pet, and took it to France's Garden of Acclimatization in the Bois de Boulogne, where it thrived for about eighteen months upon a diet of maize, vegetables, and bread, and slept during the day. After its death, its body attracted the attention of acclaimed zoologist Prof. Alphonse Milne-Edwards, whose studies of it uncovered sufficient anatomical idiosyncrasies to warrant the creation for its species of a brand new family. In his description of this radically

Maned rat – an accomplished skunk impersonator

new rodent, published in 1867, he named it *Lophiomys imhausi* – 'Imhaus's maned rat'. Distributed from Kenya in eastern Africa northwards as far as Ethiopia's border with Sudan, and measuring up to 21 in long (females are larger than males), its closest relatives appear to be the cricetines (voles, hamsters, etc.), with which it is nowadays classed by some authorities.

A sluggish, generally slow-moving animal, undoubtedly the most distinctive feature of this species is its erectile mane of hair, which has a very important function. The maned rat has few enemies – and little wonder. When challenged by a would-be predator, it raises its mane, and instantly 'transforms' into a surprisingly convincing replica of one of the most feared medium-sized mammals of Africa – a long-furred relative of the weasels known as the zorilla *Ictonyx striatus*. Although only distantly related to the New World skunks, the zorilla is extraordinarily similar to them, due not only to its vivid black and white fur, but also to its deadly propensity for ejecting streams of unutterably foul-smelling liquid from its anal glands at anything foolish enough to approach it too closely. So dreaded and dreadful is its malodorous arsenal that if a zorilla approaches a lion kill, the lions will back away and wait impatiently but impotently at a safe distance until the little zorilla has eaten its fill and departed. Not for nothing is it referred to by many tribes as 'Father of the Stenches'!

Zorilla – Africa's 'Father of the Stenches'

Thus, by impersonating this Dark Continent untouchable, the relatively harmless maned rat (it does have a strong bite) is assured of similar immunity from most would-be assailants – but if it does fail to convince, it can actually exude a very toxic glandular secretion that is sufficiently potent to kill a dog if swallowed.

The Giant Rat of Sumatra, and the Cloud Rats of Luzon

Contrary to the assumption by many aficionados of the Sherlock Holmes stories that it was wholly fictional, there really *is* a giant rat of Sumatra, though until recently it *had* remained largely a mystery, even to zoologists. In 1983, however, following an in-depth study of this mighty 2-ft-long rodent, Dr Guy G. Musser (Curator of Mammals at the American Museum of Natural History) and museum research student Cameron Newcomb attempted to disperse the veil of obscurity

surrounding it by publishing its very first full scientific description, in the museum's *Bulletin*. A very large, forest-dwelling species with dense, woolly, dark-brown fur and powerful jaws, the Sumatran giant rat had traditionally been categorized as a typical, *Rattus* rat. After a meticulous investigation of its anatomy, however, one that surely would have met with Holmes's own approval, Musser and Newcomb recognized that its aural, nasal, and dental characteristics fully justified separation of this legendary form from the *Rattus* horde, so that it was officially rehoused (along with two other species) in a new genus, *Sundamys*.

Despite its name and size, the giant rat of Sumatra is not the largest species of rat in the world. This title is claimed by another little-known Asian rodent, the slender-tailed cloud rat *Phloeomys cumingi* – a denizen of the cloud-forests on the north-western mountains of Luzon, one of the Philippines. Sometimes attaining a total length little short of 3 ft and of robust build, this species is characterized by its harsh, dense pelage – interspersed with long hair and predominantly yellow-brown in colour but offset by a very striking black triangle extending backwards from its neck and shoulders. By comparison, its tail is also thickly furred, but with short, dark brown hair. Of particular note, anatomically, is its unexpectedly short-muzzled, broad head, and its molar teeth are more similar to those of gerbils than to those of other rats. All in all, a very distinctive mammal, on account of which it has become quite an attraction as a zoo exhibit; it seems to thrive well in captivity – one

Slender-tailed cloud rats – world's biggest rats

specimen born in Washington Zoo lived for more than thirteen years. Yet, very surprisingly, its biology remains almost as much a mystery today as it was when this species was first described, by Backhouse in 1839.

Sharing its habitat and distribution range is the pallid cloud rat *P. pallida*, a little smaller in size but ostensibly similar in overall morphology, except for its somewhat longer, softer fur. This species is also prized as a zoo exhibit – indeed, when London Zoo received its first specimen in 1948, which was the first cloud rat of any species to be seen alive in Europe, it commanded a full-page photograph and coverage on 23 October 1948 in the prestigious *Illustrated London News*. A third species, *P. elegans*, is known only from a single specimen, from an unknown Philippines location.

Finally, the slender-tailed cloud rat is the world's largest species of rat, but the world's most elegant must surely be one of its relatives and neighbours – *Crateromys schadenbergi*. This is the great rat of Schadenberg, also known as the bushy-tailed cloud rat (and closely allied to two obscure species – *C. paulus* and *C. australis* – each known only from a single specimen, from the Philippine islets of Ilin and Dinagat respectively). Just an inch or so shorter than *P. cumingi*, and again endemic to Luzon's mountainous cloud-forests, this quite spectacular species is everything that a rat is not supposed to be. In overt defiance of the unwritten edict that rats should be scrawny-looking creatures with short, greasy fur and naked tails, the bushy-tailed cloud rat is clothed in a most luxuriant woolly coat of extremely soft, silky texture, which is exceptionally long on its profusely furred tail, so that the resulting rodent looks more like one of Madagascar's more exotic lemurs than a mere rat. Usually dark brown or black dorsally, with slightly paler underparts, its sumptuous fur is occasionally further adorned by vividly contrasting bands of white, enhancing the already highly attractive appearance of what must assuredly be the most delightful and least rat-like rat of all.

13 *A Hive of Secrets from the Bee World*

> Providencia juntó la naturaleza acudida la dulzura de la miel
> con lo picante del aguijon en le abeja.
> [Wise Nature has combined in the bee the sweetness of its honey
> with the sharpness of its sting.]
>
> Baltasar Gracian, *Oráculo Manual* (Maxim 54)

Because of their long domestic association with humans and the vast economic importance of their principal products, honey and beeswax, honeybees have always been newsworthy creatures. Recently, however, these industrious insects and some of their non-domestic relatives have been making headlines for a variety of more unusual reasons. Some, like the remorseless progression of the dreaded 'killer' bees through tropical America, are familiar to everyone, but others, such as the selection in this chapter, may not be.

Rediscovering the King-sized King Bee

With a total length of up to 40 mm (over 1½ in) in the female, *Chalicodoma pluto* is the behemoth of bees, the world's largest species. Due to its impressive size, it is commonly called the king bee, and has a most curious history.

It was discovered in 1859 by eminent naturalist Alfred Russell Wallace, who obtained a single female on the island of Bacan, in the north Moluccas. Its body was principally black, with dark smoky wings, but bore a white band over the upper section of its abdomen's first segment, and the sides of its face were also white. Other than its massive size, the most striking features of Wallace's specimen were its mandibles (the outer set of paired jawparts in insects), which were enormously enlarged, like a pair of ebony antlers. Recognized as a radically new species, this giant bee of Bacan was scientifically described and named two years later – then promptly vanished. It seems hard to believe that an insect species as conspicuous as *C. pluto* could successfully disappear for any length of time, but with the exception of another female example caught by Wallace, no further representative of the king bee was recorded for over a century.

It was now February 1981, and entomologist Dr Adam C. Messer was undertaking some research in primary lowland forest on the Moluccan island of Halmahera. Suddenly, his attention was captured by the sight

of some huge black bees gathering resin from a tree nearby, rolling it into balls with their gigantic, antler-like mandibles. They were females of the long-lost king bee! Embarking upon the first study ever made of this species in its natural habitat (*Journal of the Kansas Entomological Society*, 1984), Messer discovered something just as surprising as its hitherto unknown existence on Halmahera. Fashioned from resin and wood, the king bee's communal nests are built inside those of tree-dwelling termites, which may explain why these extra-large bees are not spied as often as one might expect. Also of note: they do not manufacture honey, feeding directly upon the nectar and pollen that they gather from various plants. Since his original find, Messer has also discovered king bees on the nearby island of Soasiu, rediscovered them on Bacan, and collected the first recorded males – distinguished from the females by smaller size and rufous cheeks. Finally, it is reassuring to learn that the king bee's colossal size is not mirrored by a proportionately devastating sting. In fact, as its sting is smooth (rather than barbed, as in the familiar bumblebees), it is actually *less* painful than those of more modestly sized species.

A Comeback for the British Bee?

The race of honeybee native to north-western Europe, including the UK (referred to here as the 'British bee'), is known as *Apis mellifera mellifera*. It is characterized by a uniformly dark, virtually black body, notably hairy and relatively large, with a broad abdomen. In addition its proboscis (tongue) is rather short, and its wings are strong and powerful. Bee remains discovered during archaeological excavations reveal that this race existed in Britain at least as far back as the period of Viking occupation in what is now York. During 1906, however, a devastating bee epidemic known as the Isle of Wight disease seemingly annihilated it throughout the UK, so that commercial apiarists were forced to import a strain from continental Europe to replace it. This was *A. m. ligustica*, the Italian honeybee – a smaller, longer-tongued form readily distinguished by its paler, yellow body, with weaker wings and a less hairy abdomen which tapers more sharply than the British bee's.

While it fulfils the commercial needs of British beekeepers, by comparison with the British form the Italian bee exhibits certain unfortunate shortcomings. Its inferior wings are not adapted for flying during Britain's all too frequent periods of very windy weather; its sparsely haired body retains heat less effectively than the British bee's shaggier body, thus rendering it less efficient during Britain's colder spells; and, most regrettable of all, it is more aggressive, and so less easily handled.

Consequently, there has been much rejoicing recently with the discovery of some hairier, hardier bees with stronger wings and darker bodies in various parts of Scotland, Pembrokeshire, and Yorkshire (*Wild About Animals*, December 1989). Comparisons between these and the specimens unearthed with York's Viking remains have indicated that they may well be hitherto-undetected, surviving relics of pure-bred

A. m. mellifera, our supposedly lost British bee. If so, every attempt should be made to maintain and perpetuate these by beekeepers, because bees adapted for life in the colder, windier climate of north-western Europe would certainly yield a greater supply of honey in Britain than the current Mediterranean-modified immigrants from Italy.

Bees, incidentally, have been in existence in one form or another for an awfully long time. Until recently, experts believed that the first bees evolved 40 million years or so ago, but thanks to a new discovery they now know that even this was a gross underestimate. Ensconced but previously unnoticed in the New York Museum of Natural History's mineralogical collections, since 1987 a certain droplet of ancient amber has been attracting intense interest among entomologists, because the archaic but perfectly preserved bee encapsulated within it has been shown to be at least 80 million years old, providing these insects with an extra 40 million years' worth of ancestry!

Automated Song-and-dance, and the Chernobyl Bees

One of this century's most celebrated examples of entomological detective work was the Nobel Prize-winning discovery of the honeybees' dance language by Bavarian researcher Prof. Karl von Frisch. By exhaustive observation and experimentation during the 1920s–50s, von Frisch revealed that a worker bee returning to its hive after a successful session of pollen and nectar gathering can provide other workers with explicit details regarding this nutrient source's direction and distance by performing a very specific dance upon the hive's surface, whose speed and intricacy are proportional to the food source's distance from the hive, and whose orientation supplies details of the source's position and angle relative to the sun's direction. Furthermore, bees transmit additional information to one another via 'songs', comprising high-frequency rattling sounds.

These remarkable disclosures unveiled a whole new world of bee behaviour, and instigated a totally fresh field of study. Yet there is still only so much that can be discovered by detached observation. If only we could communicate *directly* with the bees, by talking to them in their own complex language of 'song and dance'.

Once, this seemed to be an accomplishment that only Dr Dolittle might aspire to achieve. Now, as revealed by Roger Highfield in a special *Daily Telegraph* science report (29 August 1989), it has become a reality, thanks to a team of German and Danish researchers, and their unique field worker – a robot bee. Fully versed in the intricate elements of bee language as deciphered by von Frisch and others, and able to reproduce any component of it in the company of real bees to test their reactions, this computer-controlled counterpart offers unrivalled opportunities for testing and expanding upon current beliefs regarding the precise meanings of specific dance steps or songs. In time, if this proves sufficiently successful, robot bees might even become available on a commercial basis, to assist beekeepers in the more efficient

understanding, control, and care of their own bees. But at present only an extremely wealthy beekeeper could afford to invest in such an aid – the current cost of a robot bee is roughly £90,000!

Presumably the robot bee has a built-in compass too, because real bees have – crystals of magnetite embedded in their abdomen, as revealed in 1978 by Princeton University biologist Dr Joseph Kirschvink and colleagues (*Science*, 15 September 1978). Moreover, magnetic fields clearly have a great influence upon bees' communication dances – Kirschvink has since shown that in very strong magnetic fields their dance behaviour becomes confused (*Journal of Experimental Biology*, 1980).

And in 1986, an event occurred that provided evidence for an even more extraordinary sense of apian perception. One day in the last week of April and totally without warning, bees gathering nectar and pollen in the fields and countryside all across Poland suddenly made (in the strictest literal sense) a bee-line for their hives, encircled their queen in a closely packed, protective assemblage of workers, and began furiously fanning her with their wings – a reaction normally induced only when the hive is threatened by grave danger. Polish beekeepers throughout the country consulted one another to explain this unprecedented, concerted reaction by their bees, but no answer was forthcoming – until a week later, and from hundreds of miles away. This was when the USSR first released news of its Chernobyl reactor's horrific nuclear explosion – detectable to *humankind* elsewhere only via the most advanced monitoring devices, yet followed *immediately after* by the mass flights home to their hives of the Polish bees.

Flesh-eating and Oil-gathering Bees

Many people assume that bees feed upon nothing but pollen and nectar, or upon honey manufactured from nectar, but certain somewhat bizarre bees have lately disproved this. One of these, which attracted scientific attention in the early 1980s, was a sting-less, social species called *Trigona hypogea*, hailing from Panama. Its unique secret was uncovered by scientist Dr David Roubik, from Panama's Smithsonian Tropical Research Institute, as documented in *New Scientist* (19 August 1982). Mystified that its nests never contained any pollen, but housed a strange substance abnormally rich in protein, Roubik became very curious concerning this unorthodox bee's diet. Ultimately, he came up with a possible answer that seemed quite extraordinary at the time, but which, if correct, would provide a most unexpected entomological revelation. His means for testing his ideas were equally unusual – after completing his Thanksgiving meal of turkey, Roubik placed the remains outside to see what would happen, because he suspected that, in unique contrast to all others bees, *T. hypogea* was a flesh-collector!

And sure enough, the turkey remains were soon hidden beneath a milling melée of *T. hypogea* bees, reducing it to a skeleton like a mass of miniature vultures! As a species that collects nothing but dead flesh, its

legs do not possess those basket-like structures for gathering pollen that are typical features of more familiar bee species.

Another intriguing exception had been revealed a few years earlier in a three-way joint report by American scientists (*Nature*, 12 May 1977). In certain species belonging to the genus *Centris* and inhabiting the more arid regions of America, the female bees do visit flowers (unlike *T. hypogea* individuals), but not in search of carbohydrate or protein. The flowers that they patronize are *Krameria* species, which possess certain highly specialized petals, fleshy in appearance and noticeably glandular. These are the focus of the bees' attention, because when they arrive they utilize sharp bristles on their first and second pairs of legs to scrape these petals, releasing trickles of oil that the bees collect using modified bristles on their third pair of legs and then transport back to their nests to feed to their larvae.

Regardless, however, of the specific nature of the substances that bees are seeking when they visit flowers, they will be able to obtain them only if they are capable of making well-executed landings on the flowers – bees that overshoot their target, or fall off the flowerheads, are not likely to prove popular back at the hive. So what is the secret of their impeccable landing prowess? In 1986, research teams at Swansea's University College and at London's Kew Gardens found the answer. To the shame of aeronautical engineers everywhere, the botanists showed that humanity was not the first species to invent airship landing lights – as with so many other sophisticated scientific discoveries, ranging from sonar and electricity to hovercrafts and antifreeze, Nature had done it all before. Painstaking examination of flower petals using high-powered electron microscopes had revealed that they bore numerous minuscule light-reflectors, which guide the bees' flight to ensure a perfect landing time after time.

The Bird, the Bees, the Badger, and the Boran

Scientists are not the only organisms interested in honeybees. In Africa, an already-intricate interrelationship between dramatically different species united in a common search for hives is now known to be even more intricate than previously supposed. One of the most formidable African mammals is *Mellivora capensis*, a bear-like relative of weasels popularly termed a honey-badger or ratel, and famed for its unusual relationship with various woodpecker-related birds called honeyguides.

Clearly a believer in doing nothing itself that it can persuade someone else to do (especially when there is any risk of personal harm), if a honeyguide chances upon a beehive it seeks to satisfy its own great liking for combs by attracting the attention of any ratel that happens to be in the neighbourhood. It achieves this via a specific call that generations of ratels have come to associate unhesitatingly with honey – their favourite food too. Accordingly, a ratel that hears this call sets off in search of its originator, who hops from tree to tree, repeating it over and over, and at the same time leading the ratel ever closer to the

Honeyguide – engages human help to obtain honeycombs

beehive. Once the hive is in sight, the honeyguide's task is complete, and it leaves the ratel to accomplish the more practical, and painful, part of the operation – ripping the hive open with its sharp claws and enduring the understandably indignant barrage of bees issuing forth. When events have quietened down somewhat, and the ratel finally leaves, satiated with combs, the honeyguide flies down to the broken hive, snaps its beak at any bemused bees still buzzing around, and partakes of the honey left behind by its more powerful partner.

As far back as the seventeenth century, however, Western travellers and explorers in Kenya alleged that the resourceful honeyguide does not rely solely upon ratels to provide it with its sweet-tasting meals; in particular, observers have told of honeyguides leading members of the nomadic Boran people to beehives, involving a very sophisticated code of communication between bird and Boran that brings success to both on the trail of honey. Until very recently, such tales were discounted as folkstories, but in 1989, following three years of intensive investigation, ornithologist Dr H.A. Isack from Nairobi's National Museum of Kenya and Zurich University researcher Dr H-U. Reyer showed that the tales were perfectly true.

As described in their paper (*Science*, 10 March 1989), Isack and Reyer

discovered that the whole chain of events is meticulously executed – not even the meeting of bird and Boran is accidental. Instead, the Boran first attract it by making a powerful whistling sound using shells or their clasped fists, and once it arrives the honeyguide itself proceeds to make a very specific call that it continues throughout its subsequent progression towards a beehive, followed closely by the Boran – who in turn keep up a constant stream of loud noises to ensure that the bird retains its own interest in the search. When the hive is reached, the honeyguide utters a much softer call, and thereafter remains silent, leaving the Boran to open the hive.

Most intriguing of all, and yielding an astonishing parallel with von Frisch's finds regarding the bees' songs and dances of communication, the Boran maintain that the specific perching heights and direction of the flight exhibited by the honeyguide actually provide them with precise details regarding the hive's direction and distance.

Yellow Rain and Pyramidal Pacifiers

Equally remarkable in its own way was the saga of the 'yellow rain'. Since the late 1970s, reports of this alleged agent of biological warfare dropping over Kampuchea and Laos have received appreciable attention from scientists, but its true identity was not disclosed until thoroughly investigated by an American research team headed by Dr Thomas D. Seeley (*Scientific American*, September 1985). Far from being an agent of warfare, this mystifying substance was found to be nothing more alarming than the pollen-rich droppings defecated *en masse* by huge swarms of *Apis dorsata*, the south-east Asian giant honeybee.

To close this celebration of bemusing bees is a most unusual snippet spotted in *Celebrity* (4 August 1988). Mindful of the mystical powers attributed by some to the ancient Egyptian pyramids, in 1984 an enterprising Queensland beekeeper called Dixon decided to construct pyramid-shaped beehives, to see what effect, if any, they would have upon his bees. Since maintaining them in these novel structures, Dixon claims that they are more productive and live longer, but are less aggressive. A singular solution, perhaps, to the killer bees dilemma?!

14 *Gulper Eels and Swamp Eels*

The jaws of darkness do devour it up.
William Shakespeare, *A Midsummer-Night's Dream*

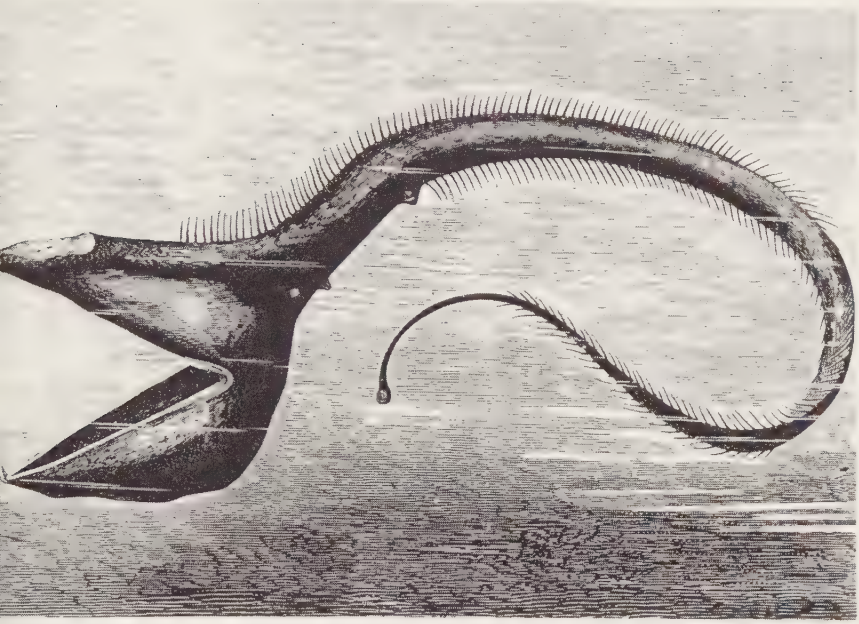
You never yet saw
Such an awfully marked elongation of jaw.
Rev. Richard Harris Barham,
The Merchant of Venice
(*not* the Shakespeare version!)

If you can picture a deep-sea fish consisting almost entirely of a gigantic cavernous mouth lined with tiny teeth, bearing a pair of ludicrously minuscule eyes perched like an incongruous pince-nez upon the upper jaw's tip, plus a long, slender, sinuous body and tail added almost as an afterthought behind the jaws, and then seal the complete creature in a cold, black, scaleless skin, the result will probably be a surrealistic nightmare bearing a strong resemblance to *Eurypharynx pelecanoides* – the stranger-than-fiction gulper eel.

Gulpers and Swallowers

A species so singular that it even has its very own, exclusive parasite (the pseudophyllidean tapeworm *Pistana eurypharyngis*, described in 1982), and generally confined to depths of 4,600–9,000 ft, in warm temperate and tropical oceans around the world, the gulper eel is the only member of its family, and was first described in 1882 by le Vaillant. Ever since, its lifestyle – and most particularly the reason for its huge mouth – has been the subject of considerable ichthyological debate, but even today this mystery remains largely unresolved. Certainly its mouth is grotesquely out of proportion to the rest of its body, accounting for as much as twenty-five percent of the fish's total 2 ft length, and is even possessed by the larva, which begins its metamorphosis from the leaf-like leptocephalus stage (characterizing all types of eel) into the adult form while still only 1–1½ in long.

The most obvious reason for having such an enormous mouth is to permit its owner to engulf prey virtually as large as itself – and this is indeed the case with a related family of fishes, often referred to as swallower eels, of the genus *Saccopharynx*, and measuring up to 6 ft long. They too have outsized mouths (which contain large curved



Gulper eel – jaws from the deep

teeth), and can increase their capacity even further by dislocating their jaws in a manner similar to that of snakes. To enable their bodies to deal with the prey after engulfment, the *Saccopharynx* swallowers have flexible stomachs, capable of distending very appreciably, and equally elastic body walls in order both to facilitate and to contain all such distension.

In stark contrast, however, the stomach of the gulper eel *Eurypharynx* is non-distensible, thereby preventing it from engulfing any but the very smallest prey. By the same token, the skin around its mouth is so fragile, and its teeth so tiny, that it would probably be unable to hold on to any large prey even if it did catch any – which is itself unlikely. Its pectoral fins are minute, its tail fin is rudimentary; as for its dorsal fin and anal fin, each of these is merely a thin strip of skin running the length of its body, along its back and underside respectively; it has no pelvic fins. And so the gulper eel must surely be incapable of anything but the most leisurely cruising speeds, and hence wholly unequipped for pursuit of fast-moving organisms. Taking all of this together, it is generally believed that *Eurypharynx* is not an active, voracious carnivore like its *Saccopharynx* cousins. Instead, it most probably spends its days slowly cruising through the inky depths with its gargantuan gape held open, in the hope that tiny crustaceans and other diminutive denizens of the deep will swim into it. At the tip of its long flexible tail is a small luminous organ that it may use as a lure, trailing it in front of its mouth to entice such creatures as these to swim inside.

Smaller than *Eurypharynx* and the *Saccopharynx* species, and assigned to another separate family, are the mysterious *Monognathus* swallowers. First brought to scientific attention in the early 1930s, when some specimens were collected during the Danish oceanographic expeditions of that time, their mouths are relatively smaller than those of the other two families' members, and are additionally differentiated by lacking upper jaws. As in *Saccopharynx*, the stomach is capable of capacious extension, suggesting a more active carnivorous mode of existence than that of *Eurypharynx*, but the total body lengths recorded for *Monognathus* specimens are much shorter than those for either *Eurypharynx* or *Saccopharynx*, none exceeding 4½ in. At present, these mini-swallowers remain almost wholly unknown, and it has been suggested by some workers that they are not genuine species at all, but merely juveniles of one or more *Saccopharynx* species.

Swamp Eels and Sea Serpents

Whilst on the subject of esoteric eels, one further group deserves a mention here, if only because it may offer a clue to the identity of one of the most contentious of all alleged sea serpents. In a series of Australian newspaper articles published during February 1965, French photographer and traveller Robert le Serrec claimed that on 12 December 1964 he had spied a dark, extraordinary-looking creature lying in shallow water just off Hook Island, in the Great Barrier Reef. Estimated by him to measure at least 70 ft in length, it resembled an enormous, limbless tadpole, with a broad, rounded head possessing wide jaws and a pair of whitish eyes, and an extremely long, sinuous body gradually tapering into a curving tail. Its left flank bore a great wound, reaching almost up to its spine.

In the presence of fellow eye-witness Henk de Jong, le Serrec attempted to film this exceptional underwater animal, but as he did so it raised its head up from the shallows' sandy bottom, and the two men fled back to their boat nearby. Afterwards they searched for the monster, but it had apparently disappeared into deeper waters, and was not spied again. In addition to his underwater film, le Serrec took some still photographs from above the water surface, which is just as well, because the film did not prove very satisfactory. On the other hand the stills were quite outstanding, and one appeared in a major exclusive article by le Serrec (*Everybody's Magazine*, 31 March 1965); that photo is reproduced here as on the opposite page.

The scientific world was thoroughly nonplussed. A wide range of identities were offered at first, but none seemed very convincing. Ultimately, surprise gave way to suspicion. For example, in his classic treatise *In the Wake of the Sea-Serpents* (1965), Dr Bernard Heuvelmans refers to it as a canard, and seems highly sceptical of the whole episode. So too, he notes, was fellow cryptozoologist Ivan T. Sanderson. Nevertheless, it was Sanderson who was responsible for proposing a very thought-provoking identity for the creature, suggesting in a *True Magazine* article (July 1965) that it might have been a giant swamp eel.

Hook Island sea serpent – a giant swamp eel?

Also termed synbranchids, swamp eels are superficially eel-like, but are not true eels; indeed, they do not seem to be closely related to any other group of fishes. Their long slender bodies are wholly devoid of pectoral and pelvic fins, and even their dorsal fin is rayless, transformed into a very low, inconspicuous ridge of skin running along the back to combine with the equally unassuming tail-fin. One species frequents the deep seas, but the others are all freshwater forms, variously indigenous to West Africa, Central and South America, and the Indo-Australian region, where they parallel the lungfishes by being air-breathers, gulping air at the water surface, and by their ability to aestivate in the mud at the bottom of ponds during the dry season or drought periods. (Incidentally, could the *buru*, Chapter 7, be an unusually large swamp eel?) Those swamp eels currently known to science do not exceed a few feet in total length, but what if a marine species of very much larger size existed? How would such a creature compare with the Hook Island sea serpent? Summarizing his views regarding the latter mystery beast, Sanderson concluded, 'The animal shown in the photographs matches neatly what a giant *Synbranchid* might look like ...'

Even so, the case as a whole failed to satisfy most authorities, so that today the Hook Island sea serpent is generally dismissed as a hoax. However, the possibility that a species of giant synbranchid exists unknown to science has not lost its credibility as a consequence – because it was not based solely upon the Hook Island incident. On the contrary, as long ago as 1819, sea serpent investigator Constantin Samuel Rafinesque suggested that certain reported sea serpents appeared to be allied to synbranchids, and Heuvelmans has reaffirmed that exceptionally large synbranchids may indeed exist.

As Joseph Conrad wrote in *Typhoon*, 'The sea never changes and its works, for all the talk of men, are wrapped in mystery.' The truth of this statement continues to be borne out with the discovery of many new and often surprising marine species each passing year, and with the occasional hint that even more surprising sea creatures still await detection – creatures like the unidentified 15-ft-long beast discovered washed ashore on a Gambian beach in June 1983, which did not resemble any species of modern-day animal but closely corresponded to a thallatosuchian, a specialized form of marine crocodilian that supposedly died out over 60 million years ago. As discussed fully in a two-part article of mine (*The Unknown*, September and October 1986) and also in Michael Bright's *There are Giants in the Sea* (1989), its carcase was not saved for scientific examination, but assuredly it will not be the last time that the sea offers up one of its secrets for scrutiny. Perhaps the next one will be a giant swamp eel ...?

15 *Kingdom of the Terror Birds*

> I will tell also of the huge bird which chased Challenger to the shelter of the rocks one day – a great running bird, far taller than an ostrich, with a vulture-like neck and cruel head which made it a walking death. As Challenger climbed to safety one dart of that savage curving beak shore off the heel of his boot as if it had been cut with a chisel. This time at least modern weapons prevailed and the great creature ... – phororachus its name, according to our panting but exultant Professor – went down before Lord Roxton's rifle in a flurry of waving feathers and kicking limbs, with two remorseless yellow eyes glaring up from the midst of it.
>
> Sir Arthur Conan Doyle, *The Lost World*

Imagine a scene in which terror-stricken horses and rhinoceroses are fleeing for their lives, pursued by a gigantic flightless bird with huge talons and an enormous hooked beak with which it will mercilessly tear its hapless victims apart. Surely the nightmare of a diseased mind, or a clip from some outrageously over-the-top science-fiction film? On the contrary – for such scenes as this were part of everyday life on the North American plains during the early Eocene epoch, 50 million years ago.

By then, the great dinosaurian dynasty had been extinct for over 14 million years. Many of the ecological niches, or lifestyles, requiring vegetarian forms – once filled by its vast assemblage of herbivorous species, such as *Diplodocus* and *Triceratops* – were now occupied by plant-eating mammals. In contrast, those niches calling for large-sized land carnivores – formerly filled by such ferocious flesh-eating dinosaurs as *Allosaurus* and *Tyrannosaurus* – had yet to attract mammalian representation, as these furry forms would not beget any sizeable meat-eaters on land for another 10 million years or so.

Instead, it was the bird lineage that sought supremacy in terrestrial carnivory during the Eocene, and in so doing provided the greatest threat to the mammals since their evolution in the shadow of the dinosaurs more than 150 million years earlier.

The Dreaded Diatrymids

The birds responsible for this daring attempt to undermine mammalian success belonged to a now-extinct order related to the cranes, and known as the diatrymids. The first species, which evolved during the Palaeocene epoch, 64–54 million years ago, were ground-dwelling birds

of modest dimensions that probably descended from primitive crane-like forms, but eventually switched to an overtly carnivorous lifestyle, transforming into giant, stout-legged, earthbound birds whose wings had become too small to sustain flight. Europe housed a number of these, including *Dasornis*, *Remiornis*, and the ostrich-sized *Gastornis*.

However, the diatrymids attained their revolutionary zenith with the early Eocene *Diatryma* species of Europe and North America, which included the most famous diatrymid of all. This was *Diatryma steini* (*giganteus*), named after the fossil collector who had found in 1916 the first virtually complete skeleton of this awesome species, which he presented to New York's Natural History Museum. An inhabitant of what is now Wyoming, there is no doubt that this huge bird must have been a terrifying sight to behold. With a total height of 7 ft, it towered over its mammalian counterparts in much the same way as a modern-day ostrich would have done. Whereas the latter is built upon relatively lissom, gracile lines, however, with long slender neck and small head (comparable, in fact, to the European diatrymid *Gastornis*), Stein's diatryma was a much more robust form.

Its limbs were proportionately shorter but much sturdier, its body was very bulky, its neck was extremely thick but relatively short, and its head was disproportionately large and laterally flattened, with a skull that measured 1½ ft in total length – equalling that of a modern-day horse. And unlike anything exhibited by an ostrich, its beak was a massively constructed, ferocious-looking weapon, almost as deep as the skull itself and with its upper half terminating in a great hook, resembling the bill of some monstrous, gigantic parrot. Its four-toed feet were equally noticeable, as each toe bore a curved, talon-like claw. In fact, the only insignificant features of this bird's morphology were its wings, which were nothing more than rudimentary stumps.

With no mammalian competitors, the diatryma contingent of diatrymids were the supreme ground-dwelling predators of the northern hemisphere in Eocene times, inhabiting grasslands and hunting the primitive herbivores that constituted some of today's most familiar plant-eating mammals. Those early forms were much smaller than their modern descendants. For example, the horse's Eocene antecedent, *Hyracotherium*, was no larger than a fox terrier, and *Hyrachy*, a proto-rhinoceros, was not much bigger. Little wonder, then, that they lived in fear of the diatrymas, which are thought to have been at least adequate runners, capable of seizing and killing any of this epoch's largest mammals, and then tearing off chunks of flesh from the carcase with their huge beak and claws. But were they?

Some researchers have challenged this traditional image of the diatrymas' lifestyle, suggesting instead that they may actually have been placid herbivores themselves, using their beaks merely for slicing fruit or scything through tussocks of grass, and employing their talons only in defence – thereby likening the diatrymas to oversized cassowaries.

Most researchers, however, continue to uphold a predatory role for diatrymas, not only basing their opinions upon anatomical considerations, but also acknowledging that after the carnivorous dinosaurs had

died out, the evolution of some type of large-sized terrestrial flesh-eater was inevitable, to maintain ecological balance. Additionally, there is the compelling fact that diatryma-like birds have evolved not once but twice – and on the second occasion there is no doubt that they were *bona-fide* meat-eaters.

Enter the Phorusrhacids

By the Eocene's close, 36 million years ago, all diatrymids everywhere were extinct – out-competed by the emergence of large mammalian carnivores called creodonts. With no descendants to perpetuate their line, it seemed reasonable to suppose that diatryma-like birds would never again exist on Earth – but then the phorusrhacids appeared.

At the end of the Cretaceous period, 64 million years ago, South America broke away from North America, becoming a massive island continent, just like Australia today. It did not reconnect with North America, via the isthmus of Panama, until the Pliocene epoch's close, a mere 2 million years ago. So for 62 million years its wildlife pursued its own, unique lines of evolution, wholly independent of those on other continents, sealed off as it was from invasion by terrestrial mammals

Life-sized model of Phorusrhacus, *a South American terror bird*

from elsewhere. During this immense span of time South America's mammals engendered a vast array of large herbivores – but surprisingly few carnivores. In fact, the only meat-eaters of comparable stature were the borhyaenids – marsupials variously resembling bears, wolves, and even sabre-toothed tigers. And so, to restore ecological equilibrium, the phorusrhacids evolved.

More closely related to the cranes than the diatrymids were, the phorusrhacids were believed until recently (see p. 123) to have first appeared during the late Oligocene epoch, around 26 million years ago. Just like the diatrymids, they began as moderately proportioned ground-dwelling birds, whose wings gradually decreased in size as the birds' overall size increased – dramatically. Before their extinction in the Pleistocene epoch over 24 million years later, the phorusrhacids had become enormous, represented by monster-sized species standing more than 10 ft tall (i.e. at least 2 ft taller than the modern-day ostrich). Probably the most famous phorusrhacid, however, was the medium-sized *Phorusrhacus* (formerly *Phororhacos*) *inflatus*, a mid-Miocene form 5–6 ft tall, inhabiting Patagonia's plains 15 million years ago (later home to the 6½- to 7-ft-tall *P. longissimus*).

The first phorusrhacid remains were unearthed in 1887 by Argentinian palaeontologist Prof. Florentino Ameghino. Unfortunately, these were not complete or near-complete skeletons, but only small, isolated fragments. Because of this, one portion – part of a phorusrhacid's lower jaw – was misidentified by Ameghino as a fragment from a prehistoric relative of the armadillos and anteaters. Happily, more extensive remains were found in 1891, which revealed that they were in truth from gigantic birds.

Very remarkably, since the phorusrhacids did not descend from them and were not even closely related to them, their overall appearance compared well with that of the diatrymids, especially the powerful diatrymas. All of the diatryma hallmarks were present – huge size, sturdy neck and legs, four-toed feet bearing formidable talons, extremely large head with enormous sharply hooked beak, and tiny useless wings. Having said that, the *Phorusrhacus* species were rather more slender than those of *Diatryma*, with slimmer, proportionately longer legs, indicating that they were faster, more efficient runners. Some closely allied species, however, notably the monstrous 'thunder-bird' *Brontornis*, were more robust, thereby providing a closer diatryma duplication.

Yet whereas controversy exists concerning whether the diatrymas were predatory, there can be no doubt at all on that score in the case of the phorusrhacids. In contrast to the parrot-like appearance of the diatrymas' huge beaks, those of the phorusrhacids were more like an eagle's, due to the much more pronounced hook on their upper half, which was undoubtedly used to seize prey, as with modern-day birds of prey. Also their talons were larger and more powerful than those of the diatrymas, and were clearly designed for ripping flesh. At the same time, their overall comparability to diatrymas is sufficiently marked to imply strongly that the two groups fulfilled the same ecological role. So

if, as seems certain, the phorusrhacids were flesh-eaters, the diatrymas must surely have been too (though perhaps less effective ones?).

Intriguingly, the phorusrhacids are one of the very few major groups of fossil birds to have attracted anything remotely approaching the level of public popularity enjoyed by such prehistoric stalwarts as the dinosaurs, mammoths, and sabre-toothed tigers – a feat no doubt accomplished by virtue of their nightmarish appearance and terrifying lifestyle. Notably, one of the most impressive of the many breathtaking exhibits at the spectacular 'Dinosaurland' exhibition at Drayton Manor Park, Worcestershire, is a full-scale, life-like model of a *Phorusrhacus*, vividly recapturing and restoring the chilling vision that confronted South America's herbivorous mammals in bygone days. (see illustration p. 119.)

A phorusrhacid even stars in at least one major science-fiction film – *Mysterious Island* (Columbia/Ameran films, 1961), based very loosely upon the Jules Verne novel. That master of movie monsters Ray Harryhausen created a very reasonable animated model of a *Phorusrhacus*, complete with small wings and huge hooked beak, which duly did its best to decimate the film's heroes before being subdued and transformed humiliatingly into their next meal. Tragically, however, the novelty value of using a *Phorusrhacus* adversary (rather than the customary dinosaur or sea monster) was lost on the the film audiences of that time – they simply thought that it was a giant chicken!

The phorusrhacids were a longer-lasting group than the diatrymids, surviving through the Oligocene, Miocene, and Pliocene epochs, so that when the isthmus of Panama rose above sea-level at the Pliocene's close, rejoining South America to North America, they were given the opportunity of invading North America, a continent that had not seen anything like them since the extinction of its own diatrymas more than 30 million years earlier. Moreover, palaeontologists have discovered that the phorusrhacids did take that opportunity, because Dr Pierce Brodkorb has described the remains of a colossal phorusrhacid from Florida (*Auk*, April 1963). Named *Titanis walleri*, and dating from the Upper Pleistocene, i.e. less than a million years ago, this North American form had a 2-ft-long skull, and stood 10–12 ft tall. Not surprisingly, phorusrhacid expert Dr Larry Marshall has dubbed it 'the terror bird', and considers it to have been 'probably the most dangerous bird ever to have existed' (*Columbus Dispatch*, Ohio, 12 February 1989). *Titanis* died out about 10,000 years ago; the others vanished even earlier – following the invasion of South America by North American carnivores when the Panamanian isthmus rose up.

Today, therefore, there are no phorusrhacids – this awesome example of avian evolution is no more. However, they are not totally without modern-day representation. Flourishing alongside them throughout their history in South America was a closely related sister group, the seriemas, which still has two species surviving here today – the 3-ft-tall crested seriema *Cariama cristata*, and Burmeister's 2-ft-tall *Chunga burmeisteri*. Although also allied to the cranes and bustards, they have slightly hooked beaks that recall those very much deadlier

Crested seriema – modern day relative of the terror birds

versions borne by the extinct phorusrhacids. In overall appearance, the seriemas call to mind that long-limbed African serpent-slaughterer the secretary bird *Sagittarius serpentarius*, and seem to have a comparable lifestyle, preying upon snakes, lizards, small rodents, and a wide range of insects.

Finally, there is no doubt at all that although the phorusrhacids have been extinct for many millennia, there is still much to be discovered regarding these immensely impressive, imperious creatures – as proven recently by a quite astounding revelation.

Antarctica's Terror Bird

During a scientific expedition spanning December 1986 and January 1987, California University palaeontologist Dr Michael O. Woodburne and his team uncovered a 3-in-long section of a gigantic fossilized beak and a 3-in-thick fossilized lower ankle joint. Both were from a

phorusrhacid, but they had not been found in South America, and not in North America either. In fact, they had been discovered on Seymour Island – just off the north-east coast of the Peninsula of Antarctica!

Subsequently documented by Woodburne and colleagues in various *Antarctic Journal* reports, this new species is the first phorusrhacid known from outside the Americas. Estimated to have stood 6–6½ ft tall (and probably a predator of the marsupial species found in the same rock strata), the Antarctic phorusrhacid has attracted great scientific interest, because its very existence effectively disrupts all previously held ideas regarding phorusrhacid evolution. After all, how could science explain the presence of a huge *flightless* bird (also unable to swim) not simply in the Americas but also in Antarctica – a totally isolated world surrounded on all sides by the vast oceans?

Contrary to popular assumption, Antarctica has not always been the ice-encapsulated contintent that it is today. Until it drifted towards the South Pole a few million years ago, it was a thriving world teeming with wildlife and bearing vast expanses of lush tropical forest, just like South America. This has been revealed by the ever-increasing number and variety of fossil species of animal and plant discovered here (especially on Seymour Island) since the beginning of this century – but that is not all.

Researchers interested in the relative positions of Earth's continents millions of years ago have traditionally believed that Antarctica became an island continent at much the same time as South America did, about 64 million years ago. This would mean that all terrestrial, flightless animals (plus those incapable of strong, sustained swimming) evolving in Antarctica *after* that time would be unique, occurring nowhere else in the world (because they would be physically unable to escape from their insular Antarctic homeland – thus paralleling the situation with animals in South America during its own period of island existence, as described earlier).

However, in fairly recent times this belief has been seriously challenged, because some fossil species have been found in Antarctica that are very closely related to others living in South America as little as 40 million years ago – which means that the two continents must have been joined (probably by an interconnecting land-bridge like the isthmus of Panama) for at least 24 million years longer than previously supposed.

Moreover, it is now believed that certain animals that were once thought to have first arisen in South America actually originated in Antarctica, only later migrating into South America via this land-bridge, because the fossils of these animals found in Antarctica have proved to be older and more primitive than those from South America.

These ideas have now gained substantial extra support, courtesy of the Antarctic phorusrhacid, which is why it is so important a find. Until now, the oldest known phorusrhacid fossils were all from South America, and only dated back to the early Oligocene, 35 million years ago. However, the La Meseta formation of rock on Seymour Island in which the Antarctic specimen's remains were discovered dates back a

further 5 million years, to the late Eocene. Moreover, some fossilized bird footprints found in the early 1980s on Antarctica's King George Island and now thought to have been made by phorusrhacids are at least 5 million years older than the beak and ankle bone.

In short, based upon fossil evidence so far obtained, phorusrhacids existed in Antarctica at least 10 million years *before* their first known occurrence in South America. Thus, unless there are even older fossils still awaiting discovery in South America, it would seem that the phorusrhacids did not originate there, as hitherto believed, but in Antarctica instead, reaching South America later via a land-bridge. Just by *being* here, therefore, Antarctica's very own terror bird has unfurled a previously unsuspected and extremely significant episode in the phorusrhacids' evolution.

Summing up, it appears that the mammals' ultimate supremacy was indeed hard won; that with foes as devastating as the diatrymids and phorusrhacids, the threat to their survival was every bit as daunting as the one already faced from the dinosaurs. Nevertheless, the dominant position held today by the mammals (which of course include harsh humankind) reveals unambiguously that they did win after all, and that the birds' bold bids to overthrow the Age of Mammals failed – but only just?

16 *Solifugids – Fleet of Foot, and Strong of Jaw*

> Though I have always viewed with horror the bird-eating tarantulas of South America, they shrank into insignificance when compared with the loathsome creature that faced us now across that lamplit room. It was bigger in its spread than a large dinner-plate, with a hard, smooth, yellow body surrounded by legs that, rising high above it, conveyed a fearful impression that the thing was crouching for its spring. It was absolutely hairless save for tufts of stiff bristles around the leg-joints, and above the glint of its great poison mandibles clusters of beady eyes shone in the light with a baleful red irridescence ...
>
> 'They were nightmare creatures, Holmes,' I exclaimed, as we retraced our steps towards the house, 'and of some unknown species.'
>
> 'I think not, Watson,' said he. 'It was the Galeodes ...'
>
> Adrian Conan Doyle, 'The Adventure of the Deptford Horror', from *The Exploits of Sherlock Holmes*

Some of the most celebrated Sherlock Holmes stories written by his creator Sir Arthur Conan Doyle featured compulsively gruesome creatures – an Indian swamp adder in 'The Speckled Band', a huge jellyfish in 'The Adventure of the Lion's Mane', and a monstrous dog in *The Hound of the Baskervilles*. This tradition was continued by Sir Arthur's son, Adrian Conan Doyle, who wrote the Sherlock Holmes tale quoted from above, which occupies a unique position in English literature as the first (and only?) detective story to feature as its principal antagonists a pair of markedly macabre but *bona fide* beasts most commonly referred to as solifugids.

During the Victorian era in which the Sherlock Holmes stories were set, solifugids were sometimes classed with spiders, but they are nowadays separated into an order of their own, of equal rank to the spiders', within the class Arachnida (also housing such creatures as scorpions, ticks and mites, harvestmen, and certain more obscure forms). On first sight, solifugids do look rather like large-bodied, long-legged spiders (they are sometimes called false, sun, or camel spiders) and are often confused with them. (Worth noting is that Sherlock Holmes's adversary actually exhibited certain unexpectedly spider-like characteristics, such as its clusters of eyes and almost hairless body; in contrast, genuine solifugids possess only a single pair of direct eyes, and are usually very hairy.) Closer observation,

Solifugid (right) battling with scorpion (left)

however, exposes several basic differences between them. Whereas the head and thorax of spiders comprise a single, undivided unit, they are well-delineated in solifugids, yielding a large head region and a short thorax. Also, the abdomen of solifugids is visibly divided into segments, whereas such segmentation in spiders is much rarer. Probably the most striking feature of any solifugid is its head, not only because of its notable bulk but also because of the exceptional size of its poison fangs (chelicerae). Actually, there is no evidence to suggest that these are armed with poison (another feature distinguishing solifugids from spiders), but what they lack in toxicity they more than compensate for in sheer power. To quote H.M. Bernard, from his *Science Progress* solifugid paper of April 1897:

> It is well ... that they are measured in millimetres and not in feet or even inches, for anything more terrible than the jaws of these creatures could hardly be imagined ... One writer speaks of them as the most horrible jaws in the whole animal kingdom, eclipsing even those of the tiger, the crocodile and the shark.

Indeed, these formidable fangs, shaped like a pair of sturdy lobster

pincers, are prob. bly stronger, proportionately, than the jaws of any other type of animal alive today, and can seize and dispatch creatures as large as rats and songbirds – even though the total body length of a solifugid does not usually exceed 3 in. Solifugids will even use these 'pincers' against an unwary human, snapping like tiny dogs at fingers or toes.

In contrast, smaller victims and food particles are captured by a much slimmer pair of mouthparts, sited just in front of the chelicerae, equipped with adhesive tips, and known as the pedipalps. Also used as organs of touch and assisting in climbing, they look sufficiently leg-like to deceive casual observers into thinking that solifugids have five pairs of legs (instead of four, like spiders and all other arachnids).

Once a prey victim has been caught and killed, it is swiftly macerated into a thick soup that the solifugid can then suck up into its mouth, thereby obtaining all of the fluids that it requires for survival. Thus it need never seek out water to drink – which is just as well, because the principal habitat of most solifugids is the arid desertlands of Africa, the Middle East, and North America (though there are also species in certain coastal regions of tropical America, Florida, and even southern Spain).

During World War I, the pugnacity of the desert-dwelling *Galeodes* solifugids attracted much attention from the soldiers stationed in Egypt and the Near East, who referred to them as jerrymanders, and sometimes kept them as pets. Indeed, as noted by eminent British zoologist Prof. John L. Cloudsley-Thompson in his *Spiders, Scorpions, Centipedes, and Mites* (2nd edn, 1968), the troops based at Aboukir used to stage battles between their solifugids, matching them as in cock-fighting contests.

Apart from their sparring prowess, however, little is known about the lifestyle of solifugids, as they have rarely been studied in detail, but they have a longstanding reputation as fearless, ferocious predators, as revealed in many eye-witness accounts. One of the most descriptive was published more than a century ago, in Rev. J.G. Wood's *Illustrated Natural History* (1859–63), featuring observations by Lieutenant-General Sir J. Hearsey, KCB, involving an Old World *Galeodes*. In one incident, it attacked a small bat (wingspan 3–4 in) fluttering under a glass shade. As recounted by Wood, the solifugid leaped onto it and then

> ... proceeded to drive its fangs into the neck, and clung so tightly that it could not be shaken off. In vain did the bat try to beat off the enemy with its wings, or to rid itself of the foe by flying in the air. Nothing could shake off the Galeodes; the long legs clung tightly to the victim, the cruel fangs were buried deeper and deeper in its flesh, the struggles gradually became weaker, until the point of a fang touched a vital spot, and the poor bat fell lifeless from the grasp of its destroyer.

Later, this same solifugid found itself pitted against a 4-in-long scorpion. The fact, however, that this opponent was not only sizeable but also, zoologically speaking, a close relative, did little to staunch the solifugid's bloodlust.

> The Galeodes seemed nothing daunted, seized the scorpion by the root of the tail, just where it could not be touched by the sting, sawed its way through the tail, severed that deadly weapon from the body, and then killed and ate the scorpion together with its tail.

Attacks upon scorpions are not uncommon when these two awesome arachnids encounter one another in the desert (see p. 126), but in such cases the solifugid aggressor is generally a female, larger and more belligerent than the male, which will usually flee from this type of confrontation. This leads to another notable characteristic of solifugids. They are extremely fleet-footed. Indeed, *Solpuga* solifugids inhabiting the arid regions of Africa and the Middle East hold the *Guinness Book of Records* title as the world's fastest land-living invertebrates, with a burst sprint capability estimated at 10 miles/hour. To enable them to attain such speeds, and to sustain a highly active existence, their respiratory system is more advanced than that of true spiders; whereas the latter breathe by means of leaf-like structures termed book-lungs, a solifugid's body is permeated by a ramifying series of tiny tubes called tracheae, resembling the respiratory system of insects.

Although a few solifugids are abroad during the day (hence the name 'sun spider'), most species are predominantly nocturnal ('solifugid' translates as 'fleeing from the sun'). During the course of history their night-time activities have given rise to a variety of strange and often lurid legends, together with certain comparably curious hypotheses, as summarized in various publications by Prof. Cloudsley-Thompson (after whom the solifugid *Rhagodessa cloudsley-thompsoni* was named in 1964 by P.L.G. Benoit).

For example, A.A.H. Lichtenstein, writing in 1797, was not satisfied with the traditional translation from Hebrew into English of the Old Testament's First Book of Samuel; instead, he considered that the creatures plaguing the Philistines when they captured the Ark of the Covenant were not mice, as generally accepted, but solifugids! Moreover, he postulated that the sores or 'emerods' suffered by the Philistines were really caused by solifugid bites. Not surprisingly, this distinctly odd interpretation failed to gain much support. However, it is true that the body and legs of some species of solifugid are hairy enough to create, when coupled with their scurrying activity, the appearance of furry mice.

Also, it has been verified that on occasion solifguids will assault travellers sleeping on the desert sands. Such incidents are responsible no doubt for the highly exaggerated terror that these creatures inspire in some Egyptians who believe that solifugids will crawl into a person's bed at night and bore into the unfortunate sleeper's groin, in order to deposit their eggs there. Another equally bizarre but unfounded belief is that if a solifugid should somehow become entangled in a woman's hair, it cannot be removed until its chelicerae have sheared through the entangling locks (hence its Afrikaans name, *haarskeerder* – 'hair-cutter').

They may be relatively small in size, but the stature of their fear-generating prowess is more than sufficient to explain why Adrian Conan Doyle chose a pair of solifugids as the Deptford Horror;

certainly they are among the most novel adversaries ever faced by his father's famous if fictitious detective.

17 *The Bird with Four Wings, and Other Nightjar Novelties*

> They are birds of omen and reverential dread. Jumbo, the demon of Africa, has them under his command, and they equally obey the Yabahou, or Demeraran Indian Devil. They are receptacles for departed souls who come back again to earth, unable to rest for crimes done in their days of nature; or they are expressly sent by Jumbo or Yabahou to haunt cruel or hard-hearted monsters, and retaliate injuries received from them.
>
> Charles Waterton, *Wanderings of a Naturalist in South America*

The birds to which Waterton was referring were nightjars, those long-winged, short-legged birds of woodland habitat and of nocturnal but harmless, inoffensive nature, whose intrinsic elusiveness has engendered all manner of completely unfounded myths and superstitions throughout their distribution (even in the West there is a bizarre but baseless country belief that they suck milk from the nipples of nanny goats). Most are drab, nondescript species, but there are some very notable – and noticeable – exceptions.

Standards and Pennants on the Wing

Senegal's Mandinka tribe speak of a strange entity that they refer to as 'the bird with four wings', and Europeans visiting Senegal and other West or Central African countries have sometimes encountered a peculiar bird that seems, when seen in flight, to be perpetually pursued by a pair of small bats. In fact, it is neither four-winged nor bat-pursued – for this is the extraordinary standard-winged nightjar *Macrodipteryx longipennis*. Formally described in 1796 from Sierra Leone by George Shaw, it looks much like any other mottle-plumaged nightjar, except for one diagnostically dramatic difference. On each wing, the second primary feather is enormously elongated, attaining a length of up to 21 in (i.e. three times as long as the entire wing). For most of its length, each of these feathers is completely bare, lacking a vane, but at the tip it is vaned, taking the form of a dark-brown racquet-shaped standard, roughly 6 in long. When the bird is in flight, these spectacular standards trail above and behind it like kites on strings, an extra pair of wings, or even a couple of small birds or bats, thus explaining the Mandinkas' name for it, and the bat-pursuit illusion – enhanced by its preference for flying at twilight, when viewing conditions are poor.

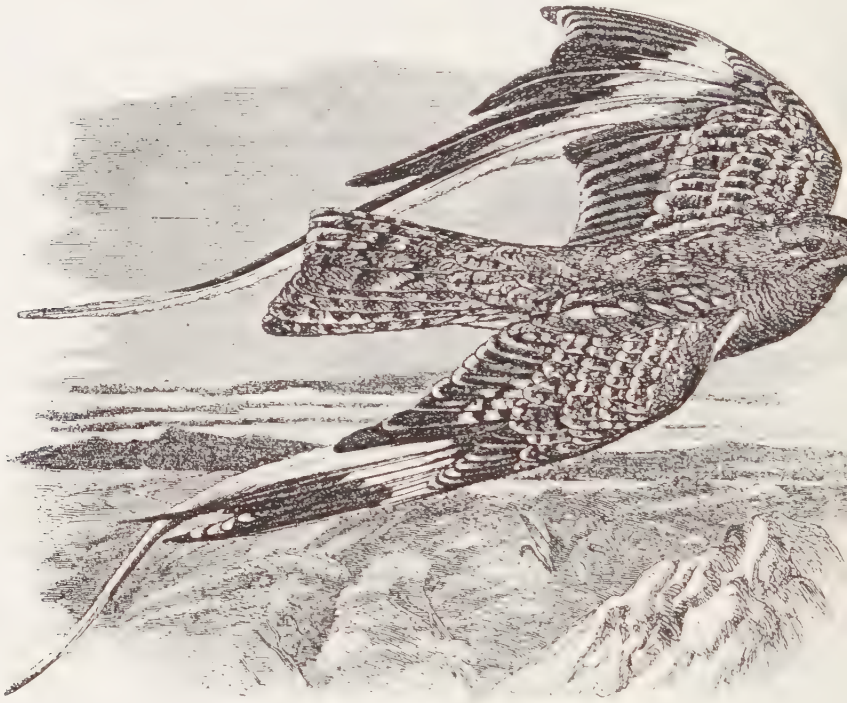
Standard-winged nightjar – Senegal's 'bird with four wings'

But what is the purpose of the standards? For a long time this remained unanswered, due to the rarity of sightings by ornithologists. Even preserved specimens in museums were scarce, which makes a London *Daily Mail* report for 11 April 1896 of great worth, recounting the rediscovery of a taxiderm specimen by a Mr Coburn of Holloway Head.

> Thirty years ago a Dublin friend gave it to Mr. Coburn, but he was unable to stuff it, as the skin was so tender that it crumbled under the finger. Mr. Coburn threw the fragments aside. Not long ago he remembered the prize, and finding that it was an almost unique specimen hunted for it, and luckily found it among his stores. After three days' work he put it together, and now it looks lifelike. He knows of no other stuffed specimen, for so far as he can ascertain, not even the Kensington Museum possesses one of these rare creatures.

A lucky find indeed. At the time of that report, it appeared that only a single European had ever seen a living standard-wing in its native homeland. This sighting had been made by Joseph Gedge, while accompanying Sir Samuel Baker's Sudan expedition. Gedge had observed a specimen squatting on the ground, and noticed that its standards were held upright, so that they resembled a pair of grass

stems, each stem bearing a feathery head waving back and forth in the breeze. From this observation, it was suggested that the standards serve as lures, enticing moths and other night-flying insects to settle on them while the bird sits concealed in long grass. Once the unwary insect has alighted, the standards are drawn down into the grass, to the mouth of the hidden nightjar. A very ingenious theory, but later shown to be totally incorrect.



Pennant-winged nightjar

In fact, like so many extreme plumage modifications exhibited by birds, the standards are used in mating displays. They are only possessed by the male, which displays in groups of one to four before an audience of about four females, perched separately on open ground. Within this arena, the males perform slow, aerial figure-of-eight dances, with bowing wings to elevate their standards, which glide above them like feathery pom-poms as the females sit and watch. Each display lasts no longer than 10 seconds or so, but they are repeated every 1–3 minutes for at least 15 minutes, according to Fry, Keith, and Urban in their *The Birds of Africa, Vol. 3* (1988). It is believed that once the mating season is over, the males deliberately break off their standards, leaving the vaneless stems behind; if true, this presumably prevents them from impeding normal flight.

Whereas West Africa has the standard-winged nightjar, southern Africa is home to the pennant-winged nightjar *Semeiophorus vexillarius*, first described in 1838 by renowned bird painter John Gould, and a species with equally extraordinary plumes. Once again, the feathers in question are the second pair of wing primaries, which are immensely long, measuring up to 31 in (once again three times as long as the total wing length). In the case of the pennant-winged nightjar, however, these feathers are fully-vaned throughout their length, and are white in colour, continuing a white stripe that runs across the otherwise dark shading of the wings to yield a striking pair of pennants. Present only in the male, and in pristine condition only during the breeding season (afterwards they generally break off or fray), these pennants are used for courtship displays, the male flying at treetop height with pennants trailing during the early evening in autumn, and sometimes accompanied by the female. The males must appear quite uncanny, even spectral, to the unacquainted observer – and especially so in the case of the freak albino specimen reported in 1966 by A.J. Tree in the journal *Ostrich*.

Strange Tales of Strange Tails

No less spectacular than the standard-wing and pennant-wing is *Uropsalis lyra*, the exquisite, almost unreal, lyre-tailed nightjar of Colombia. First described in 1850 by Bonaparte, the lyre-tail is one of several New World nightjars with incredibly lengthy tails. In sharp contrast to its modest-sized, 11-in-long body, its outermost tail feathers measure around 3 ft in length, and are curved outwards towards their tips to create the elegant lyrate outline that has earned this species its name. Closely related is its comparably long-tailed and fittingly named neighbour, the swallow-tailed nightjar *U. segmentata*, and the tail feathers are just as lengthy in the long-trained nightjar *Macropsalis creagra*, an inhabitant of south-eastern Brazil.

In the shear-tailed nightjar *Hydropsalis climacocerca* ('ladder-tailed water-shearer'), the two outer and the two centremost pairs of tail feathers are equally elongated. Inhabiting the Amazon Basin and extending northwards as far as Guyana and French Guiana, this striking species, first described in 1844 by Tschudi, earns its unusual scientific name from the rung-like bars across its long tail feathers, and from its habit of opening and shutting those pairs of feathers like shears or scissors when flying over pools within its forest domain. A near relative is *H. braziliana*, the scissor-tailed nightjar, of comparable appearance and habit. The sight of such exceptional birds flitting through a shadowy forest or skimming over the surface of a still jungle pool could well be sufficiently strange to explain their unearthly identity in native myths.

The Mystifying Devil-bird – Often Heard, Rarely Seen

None, however, has engendered the degree of speculation and terror

Lyre-tailed nightjar

inspired by the notorious devil-bird of Sri Lanka – a bird which, unlike the others described here, is more noted for its ability to *avoid* being seen than for its visual distinction. It earns its sinister name from its truly hideous cry, described by one 'ear-witness' (see Mitford below) as sounding like 'a boy in torture, whose screams are being stopped by being strangled'. Reports of this macabre creature have been documented for centuries, but its identity is still unresolved, as I have discussed in a detailed article on this subject (*Fate*, January 1989). At one time the most popular identity was that of Sri Lanka's common brown owl *Strix leptogrammica ochrogenys*, but if the devil-bird is really as common and widespread a species as the brown owl, why should its identity have ever been mysterious to begin with? Some, like George M. Henry in his *Guide to the Birds of Ceylon* (1955), prefer to believe that its eldritch cries are the mating calls of the Sri Lankan eagle owl *Bubo nipalensis blighi*. Certain others, such as Dr R.L. Spittel, favour one or more of the island's species of eagle (*Loris*, 1968), and there is also the possibility that a species of water rail or crake may be involved – birds famous for their vociferous screams and powers of concealment. Yet one of the few people ever to have seen (rather than merely heard) a devil-bird offered a wholly different identity.

In his *Sketches of the Natural History of Ceylon* (1861), Sir J. Emerson

Sri Lankan wood owl – the eerie devil-bird?

Tennent recorded the eye-witness account of a Mr Mitford of the Ceylon Civil Service, to whom the island's avifauna was well known. According to him, the devil-bird is not an owl, eagle, or rail, but a pigeon-sized, long-tailed bird that he believed to be some form of nightjar. Moreover, in his *A History of the Birds of Ceylon* (1880), William Vincent Legge specifically suggested Sri Lanka's jungle nightjar *Caprimulgus indicus kelaarti* as a possible devil-bird identity. Conversely, whereas the shape of Mitford's bird is compatible with a nightjar, none of Sri Lanka's recognized forms is known to produce the horrific shrieks that are the devil-bird's terrifying trademark. However, much of the island's forests, especially the denser ones reputedly inhabited by this eerie entity, have yet to be fully explored – does an unknown species of nightjar survive here, safeguarded by the superstitious horror that its bloodcurdling cry engenders?

Charles Waterton collected material concerning the tears and fancies inspired by nightjars among the natives of many parts of the world; a great pity, therefore, that he never encountered the Sri Lankan devil-bird, which may one day be unmasked as the most successful myth-generating nightjar of all!

18 *Snake-stones and Serpent-kings*

> A very curious subject ... is the power of extracting venom from a wound inflicted by reptiles, attributed to the 'snake-stone,' which the Hindoos and Cingalese usually carry with them.
>
> Philip H. Gosse, *The Romance of Natural History, Second Series*

Snake-stones, Scorpion-stones – and Catfish-stones?

Snake-stones and their alleged powers of extracting venom from seemingly fatal snakebites have generated substantial debate for centuries. Many adamantly deny that there is any substance to the numerous accounts on record, but there are others who believe just as firmly that the prompt application of one of these strange objects has saved them from certain death. Nowadays, they scarcely rate a mention in wildlife books, but many pre-twentieth-century works contained detailed accounts, including the following selection. Read them now, and consider for yourself the curious case of the snake-stones.

The use of snake-stones and their reputed properties have been reported from many parts of the world harbouring highly venomous snakes, but in particular from those frequented by the most famous venomous snake of all – *Naja naja*, the common Asian cobra or *cobra de capello* ('hooded cobra'), a name commonly applied to it prior to the 1900s but not so widely used today. Some of the most familiar accounts of snake-stone use in relation to cobra bites are those included in Sir J. Emerson Tennent's *Sketches of the Natural History of Ceylon* (1861), where the snake-stone is referred to as the *pamboo-kaloo*. These incidents featured some impeccable eye-witnesses. For example:

> On one occasion, in March, 1854, a friend of mine was riding, with some other civil officers of the Government, along a jungle path in the vicinity of Bintenne, when he saw one of two Tamils, who were approaching the party, suddenly dart into the forest and return, holding in both hands a cobra de capello which he had seized by the head and tail. He called to his companion for assistance to place it in their covered basket, but, in doing this, he handled it so inexpertly that it seized him by the finger, and retained its hold for a few seconds, as if unable to retract its fangs. The blood flowed, and intense pain appeared to follow almost immediately; but, with all expedition, the friend of the sufferer undid his waistcloth, and took from it two snake-stones, each of the size of a small almond, intensely black and highly polished, though of an extremely light substance. These he applied, one to each wound inflicted by the teeth of

Cobras – can their bites be alleviated by snake-stones?

> the serpent, to which they attached themselves closely; the blood that oozed from the bites being rapidly imbibed by the porous texture of the article applied. The stones adhered tenaciously for three or four minutes, the wounded man's companion in the meanwhile rubbing his arm downwards from the shoulder towards the fingers. At length, the snake-stones dropped off of their own accord; the suffering of the man appeared to subside; he twisted his fingers till the joints cracked, and went on his way without concern

The second incident related by Tennent is no less astonishing.

> In another instance, in 1853, Mr. Lavalliere, then District Judge of Kandy, informed me that he saw a snake-charmer in the jungle, close by the town, search for a cobra de capello, and, after disturbing one in its retreat, the man tried to secure it, but, in the attempt, he was bitten in the thigh till blood trickled from the wound. He instantly applied the *Pamboo-Kaloo*, which adhered closely for about ten minutes, during which time he passed the root which he held in his hand backwards and forwards above the stone, till the latter dropped to the ground. He assured M. Lavalliere that all danger was then past. That gentleman obtained from him the snake-stone he had relied on, and saw him repeatedly afterwards in perfect health.

The root used by the snake-charmer seems to have been either the stem of an *Aristolochia* or that of some form of jungle vine. As for the snake-stone's composition, Tennent later submitted one to the famous research chemist Prof. Michael Faraday for analysis. In reply, Faraday

stated that in his belief it was

> ... a piece of charred bone which has been filled with blood perhaps several times, and then carefully charred again. Evidence of this is afforded, as well by the apertures of cells or tubes on its surface as by the fact that it yields and breaks under pressure, and exhibits an organic structure within. When heated slightly, water rises from it, and also a little ammonia; and, if heated still more highly in the air, carbon burns away, and a bulky white ash is left, retaining the shape and size of the stone.

Predictably, the ash proved to be largely calcium phosphate in composition. Continuing with Faraday's comments:

> ... if the piece of matter has ever been employed as a spongy absorbent, it seems hardly fit for that purpose in its present state; but who can say to what treatment it has been subjected since it was fit for use, or to what treatment the natives may submit it when expecting to have occasion to use it?

Summing up the case, Tennent concluded, quite reasonably:

> The probability is, that the animal charcoal, when instantaneously applied, may be sufficiently porous and absorbent to extract the venom from the recent wound, together with a portion of the blood, before it has had time to be carried into the system; and that the blood which Mr. Faraday detected in the specimen submitted to him was that of the Indian on whose person the effect was exhibited on the occasion to which my informant was an eye-witness.

Many snake-stones used in Sri Lanka apparently originate from India, brought to the island by travelling snake-charmers from India's Coromandel coast. Moreover, according to Dr John Davy's *An Account of the Interior of Ceylon, and of Its Inhabitants* (1821), they also reach Sri Lanka via Indian merchants who purchase them from the monks of Manilla. Davy described three main types: one composed of partially burnt bone and slightly absorptive, a second manufactured from chalk, and a third made from plant material and resembling bezoar; the latter two are not absorptive.

In view of the plentitude of poisonous snakes inhabiting tropical Africa, it should come as no surprise to learn that the use of snake-stones is prevalent here too. As far back as 1772, Carl Peter Thunberg described seeing snake-stones used by the Boers in South Africa's Cape Province. Once again these were mostly imported from India, particularly from Malabar, though at such extortionate prices that few of the South African farmers could afford to purchase them. Examining one of these stones, Thunberg described it as being black in colour, convex on one side, and so porous that bubbles rose out of it when it was plunged into water.

Mexican snake-stones had been brought to popular attention in 1829, by R.W.H. Hardy's book *Travels in the Interior of Mexico*. Then, on 30 January 1860, he communicated some further details, received by

Tennent, regarding their preparation. In Mexico, the snake-stone is called the *piedra ponsona*, and according to Hardy is prepared as follows:

> Take a piece of hart's horn [stag antler] of any convenient size and shape; cover it well round with grass or hay, enclose both in a thin piece of sheet copper well wrapped round them, and place the parcel in a charcoal fire till the bone is sufficiently charred. When cold, remove the calcined horn from its envelope, when it will be ready for immediate use. In this state it will resemble a solid black fibrous substance, of the same shape and size as before it was subjected to this treatment.
> USE – The wound being slightly punctured, apply the bone to the opening, to which it will adhere firmly for the space of two minutes; and when it falls, it should be received into a basin of water. It should then be dried in a cloth, and again applied to the wound. But it will not adhere longer than about one minute. In like manner it may be applied a third time; but now it will fall almost immediately, and nothing will cause it to adhere any more. These effects I witnessed in the case of a bite of a rattle-snake at Oposura, a town in the province of Sonora, in Mexico, from whence I obtained my recipe.

This detailed but wholly unsensationalized account aroused the curiosity of Rev. J.G. Wood, who decided to follow Hardy's recipe and see whether he could indeed manufacture a snake-stone in this manner. Recounting his experience in his *Illustrated Natural History* (1859-63), Wood recorded:

> Being desirous of testing the truth of this recipe, I procured a piece of stag's-horn, cut it into proper shape, and exposed it to the heat of a fierce charcoal fire for an hour and a half. On removing it from the copper, the hay had been fused into a black mass, easily broken, and forming a complete cast of the inclosed horn, which fell out like an almond from its shell. On comparing the charred horn with the veritable Snake-stones, I find them to be identical except in the polish. The fracture of both is the same, and when exposed to a white heat in the air, my own specimen burned away, leaving a white ash precisely as related of the real specimen [analysed by Faraday], and the ashes of both are exactly alike, saving that my own is of a purer white than that specimen calcined by Mr Faraday, which has a slight tinge of pink, possibly from the absorbed blood. On throwing it into water, it gave out a vast amount of air from its pores, making the water look for a few seconds as if it were newly opened champagne, a peculiarity which agrees with Thunberg's description of the Snake-stone used at the Cape ... The rather high polish of the Cingalese Snake-stone I could not rightly impart to my own specimen, probably for want of patience. I found, however, that by rendering the surface very smooth with a file, and afterwards with emery paper, *before* exposing it to the fire, it could be burnished afterwards by rubbing it with polished steel. Even in the original objects, the polish is not universal, the plane side being much rougher than the convex.

So far, only the application of snake-stones to snake-bites has been mentioned, but in some localities they have wider uses. In Sri Lanka and India, for instance, they are also said to be highly efficacious in the

extraction of poison from scorpion stings, as demonstrated by the following incident, reported by Major-General Edward Napier in his *Scenes and Sports in Foreign Lands, Vol. 2* (1840).

> These people generally have for sale numbers of *snake-stones*, which are said to be equally an antidote against the bite of the serpent and the sting of the scorpion. For the former I have never seen it tried; and to prove its efficacy with the latter, the samp-wallah generally carries about in small earthen vessels a number of these animals, one of which he allows to wound him with his sting. The snake-stone, which is a dark, shining, smooth pebble, about the size and shape of a French bean, on being applied to the wound, instantly adheres to it, and by a power of suction appears to draw out the poison, which is supposed to be contained in the small bubbles which, on the immersion of the stone into a glass of water, are seen in great numbers to rise to the surface.
>
> My first idea on beholding the samp-wallah allow himself to be stung by the scorpion was, that the latter had by some means been rendered harmless. However, not wishing voluntarily to put this to the test by personal experience, I purchased some of the stones, resolved on the very first opportunity to try their efficacy. Shortly after this, happening to be marching up the country with a detachment, we pitched our camp on some very stony ground, in clearing which one of the English soldiers happened to be bit [stung] in the hand by a large scorpion. As soon as I heard of this circumstance, I sent for the sufferer, who appeared to be in great pain, which he described as a burning sensation running all the way up his arm to the very shoulder.
>
> I applied one of the snake-stones to the puncture; it adhered immediately, and during about eight minutes that it remained on the patient, he by degrees became easier; the pain diminished, gradually coming down from the shoulder, until it appeared entirely confined to the immediate vicinity of the wound. I now removed the stone: on putting it into a cup of water, numbers of the small air-bubbles rose to the surface, and in a short time the man ceased to suffer any inconvenience from the accident.

In 1927, black, porous 'scorpion-stones' were shown to Dr Graham Netting by the monks of Trinidad's Mount St Benedict. When analyzed, they were found to be composed of animal bone charcoal, and when placed upon moistened skin they remained attached until they had absorbed some moisture, after which they dropped off, suggesting that they may indeed be of use in drawing out poison from a freshly inflicted scorpion sting wound. And in rural areas of the USA, 'madstones', created from a variety of substances (including bone, deer antlers, certain porous minerals, and sometimes even semi-precious stones) have been used against scorpion stings, as well as bites from rabid dogs.

One of the most unusual incidents in which a snake-stone was employed was described by D. Hervey (*Nature*, 24 May 1900).

> A good many years ago, when sea-bathing in the Old Straits of Singapore (i.e. those separating the island from the Malay Peninsula), I put my foot in a slight muddy hollow in the sandy sea-bed; the moment I did so, I received an agonising stab near the ankle (from some red-hot poisoned

> blade, it seemed) which drove me in hot haste ashore, where a Malay constable on hearing what had happened, and on examining the wound, pronounced my assailant to be the 'ikan sembilang' (sembilang fish), *Plotosus canius*, one of the siluroids [catfishes], I am informed by Mr Boulenger of the British Museum. The fish is armed with three powerful spines on the head, one projecting perpendicularly from the top, and one projecting horizontally from each side. The Malay lost no time in running to the barracks near by, whence he shortly returned with a little round charcoal-like stone about the size of a small marble. This he pressed on to the wound, to which it adhered, and remained there by itself, without any continuation of pressure, for a minute or more. Then it fell off, and black blood began to flow, which, after a little, was succeeded by blood of normal colour. The pain, which had been excessively acute, began to diminish soon after this, and in an hour had practically disappeared. The wound gave me no further trouble, but a fortnight afterwards I noticed a hole about the size of a pea where the wound had been ... The black stone applied by the Malay to the wound came, he alleged, from the head of a snake, and claimed, therefore, to be a bezoar stone. It was, no doubt, a snake-stone, probably made of charred bone, and therefore porous in character, which would account for the adhesive and absorptive powers it displayed in my case.

Leaving aside momentarily the curious Malay belief that such objects originate from the heads of snakes, is there still room for doubt that at least those snake-stones composed of charred bone or horn can really alleviate the effect of venomous bites, stings, and the like? Modern-day sceptics find it difficult to believe that such an object can generate sufficient powers of suction quickly enough to draw the venom out of the wound before the victim's blood circulatory system begins to transport it further into the body. This criticism was also voiced by Sir Joseph Fayrer in his *The Thanatophidia of India* (1872), and by other snake-stone sceptics of the late nineteenth century, when interest in snake-stones had reached its zenith. However, in defence of the snake-stone's abilities, it must be pointed out that accounts describing its actions generally state specifically that it was (or should be) applied *straight after* the bite or sting had occurred (if it were to exert its full effect), i.e. well *before* the venom had begun to pervade the victim's system.

In any event, consider the educated, reliable nature of many of the eye-witnesses whose testimonies have been presented here. In some cases, moreover, they had even admitted to scepticism concerning the natives' claims regarding snake-stones prior to witnessing with their own eyes the startlingly effective results obtained with them. Can we really justify choosing to discount all of this testimony as fraudulent or mistaken, as we must do if we are to deny the capability of snake-stones? Furthermore, if snake-stones *are* impotent, is it not a quite extraordinary coincidence how similar are all of the cases reported here, despite having occurred independently of one another and in totally different parts of the world and involving very dissimilar forms of animal? Unless there is at least some degree of truth to the snake-stone belief, it is highly unlikely that localities so distant from

one another as those cited in this chapter could yield such similar accounts, corresponding with one another not just in general features but also in much more specific, ostensibly insignifcant ones.

Cobra-jewels and Adder-stones

The curious Malay belief recalled by Hervey, that snake-stones were derived from the heads of snakes, is immediately reminiscent of the toadstone (bufonite) myth – '... the toad, ugly and venomous, wears yet a precious jewel in his head', as Shakespeare wrote in *As You Like It*. The snake-stone equivalent to this is not confined to Malaysia – in a short *Nature* report (26 July 1900) responding to Hervey's, and based upon information received from a Mr E.H.L. Schwarz of Cape Town, it was disclosed that South African farmers also hold this belief. However, as the report commented, it may have reached there via the Malay slaves obtained from Batavia by the early Dutch.

In *Venomous Reptiles* (1971), Sherman and Madge Minton report that in India it is believed that some cobras bear in their hood a dark brown, luminous stone termed a *mun*, which heals snake-bites instantaneously. Those that the Mintons examined proved to be bezoar stones, or enteroliths (stones swallowed by various animals to aid digestion), or, in most cases, samples of heat-treated agate.

A similar myth was documented by Tennent from Sri Lanka.

> One curious tradition in Ceylon embodies the popular legend, that the stomach of the cobra de capello occasionally contains a precious stone of such unapproachable brilliancy as to surpass all known jewels. This inestimable stone is called the *nāga-mānik-kya;* but not one snake in thousands is supposed to possess such a treasure. The cobra, before eating, is believed to cast it up and conceal it for the moment; else its splendour, like a flambeau, would attract all beholders. The tales of the peasantry, in relation to it, all turn upon the devices of those in search of the gem, and the vigilance and cunning of the cobra by which they are baffled; the reptile itself being more enamoured of the priceless jewel than even its most ardent pursuers.

One of the oddest of such myths, and which serves perfectly to link this chapter's snake-stone section with the serpent-king section to come, is that of the adder-stone, also known as the *ovum anguinum* ('snake-egg'). This is a stone-like object that originates as a ball of froth exuded by entwined masses of snakes (often common adders *Vipera berus*) at midsummer – at least according to an ancient Celtic belief reported by the Druids of Gaul and documented by Roman philosopher Pliny the Elder. This was the inspiration for the druid song included by English poet William Mason within his epic poem *Caractacus* (1759).

> From the grot of charms and spells,
> Where our matron sister dwells,
> Brennus, has thy holy hand
> Safely brought the Druid wand,
> And the potent Adder-stone,

Gender'd 'fore the autumnal moon?
When in undulating twine
The foaming snakes prolific join,
When they hiss, and when they bear
Their wondrous egg aloft in air;
Thence, before to earth it fall,
The Druid in his hallowed pall
Receives the prize,
And instant flies
Followed by the invenom'd brood,
Till he cross the crystal flood.

The last lines record the belief that the adder-stone could protect anyone who captured it (within a cloth, and before it hits the ground) from poison and all manner of other undesirable substances, provided that he could successfully escape the pursuing adders – by crossing a river. According to eighteenth-century naturalist Thomas Pennant:

> Our modern Druidesses give much the same account of the ovum anguinum (Glein Neidr, as the Welsh call it; or the adder-gem) as the Roman philosopher [Pliny] does; but seem not to have so exalted an opinion of its powers, using it only to assist children in cutting their teeth, or to cure the hooping-cough, or drive away an ague.

Actually, it is unlikely even to have achieved these modest feats, for although adder-stones, ova anguina, and the like genuinely existed, as reported by geologist Dr Michael Bassett in his fascinating booklet *'Formed Stones', Folklore and Fossils* (1982) they were merely fossil sea urchins, also known from Cornwall and referred to there as *milprev* or *milpref*.

Serpent-kings

Occasionally, a group of rats is discovered whose members (sometimes as many as twenty) are closely huddled together and found to be inextricably bound to one another by their hopelessly entangled tails. Such a congregation is known as a rat-king, of which there are many records (some dating back centuries) and a few highly prized, painstakingly preserved specimens in museums. However, the phenomenon remains a source of mystery to zoologists, who still cannot explain satisfactorily how the tails of the rats managed to become inseparably intertwined in this Gordian manner. A smaller number of cases involving squirrels – squirrel-kings – are also known, plus at least one fieldmouse-king. And if a cat gives birth to a litter of kittens whose umbilical cords are similarly tangled, the litter is termed a cat-king.

There are certain cases of extraordinary intertwined snake masses on record too; hence for the sake of nomenclatural uniformity, it would seem appropriate to refer to these as serpent-kings. Such throngs have been spasmodically reported for a long time, with a number of different species, and because of their grotesque appearance have generally

A small serpent-king of adders

attracted appreciable if cautious attention from their startled eye-witnesses.

During his expeditions through Guyana during the late eighteenth century, explorer Alexander von Humboldt recorded seeing some piles of entwined serpents, which since then has served as an inspiration to others to make a point of documenting comparable sights. In 1848, for example, an anonymous *Scientific American* account of its author's travels across the Izacubos savannahs in Guyana contained a vivid description of what he called 'the most wonderful, and most terrible spectacle that can be seen'. He continued,

> We were ten men on horseback, two of whom took the lead, in order to sound the passages, whilst I preferred to skirt the great forests. One of the blacks who formed the vanguard, returned at full gallop, and called to me

> – 'Here, sir, come and see the serpents in a pile'. He pointed out to me something elevated in the middle of the Savannah or swamp, which appeared like a bundle of arms. One of my company then said, 'this is certainly one of the assemblages of serpents, which heap themselves on each other after a violent tempest; I have heard of these but have never seen any; let us proceed cautiously and not go too near'. When we were within twenty paces of it, the terror of our horses prevented nearer approach, to which none of us were inclined. On a sudden the pyramid mass became agitated; horrible hissing issued from it, thousands of serpents rolled spirally on each other shot forth out of their circle their hideous heads, presenting their envenomed darts and fiery eyes to us. I own I was one of the first to draw back, but when I saw this formidable phalanx remained at its post, and appeared to be more disposed to defend itself than attack us, I rode around it in order to view its order of battle, which faced the enemy on every side. I then thought what could be the design of this numerous assemblage, and I concluded that this species of serpents dread some collosean enemy, which might be the great serpent or cayman [a type of crocodile], and that they re-unite themselves after having seen this enemy, in order to resist him in a mass.

Reading this graphic account, it occurred to me that an unexpected encounter with such a horde in olden days may well have helped to foster the famous Greek myth of the multi-headed hydra; assuredly, it would be an almost supernatural spectacle to witness, and one likely to remain in the onlooker's memory for many a long day afterwards.

As for the above author's record that these serpent-kings were presumed to be formed following a violent storm, and his own notion that they amass as a means of defending themselves against a very much larger enemy, neither of these is really very plausible. Rather, it is much more likely that what he encountered was a frenzied mating *en masse*.

After emerging in spring from a winter's hibernation, some snake species congregate in enormous numbers for mating. In the case of the North American garter snake *Thamnophis* (formerly *Eutoenia*) *sirtalis*, for instance, a harmless handsomely striped species related to Britain's grass snake and smooth snake, several hundred males will all seek to copulate with a comparatively small number of females. In one closely monitored incident, a pre-copulating serpent-king comprised a solid ball of 15–20 garter snakes, observed by J.B. Gardner, on 18 April 1954 at Seymour, Connecticut (*Copeia*, 1955); in April 1955 he saw a second example, again at Seymour (*Copeia*, 1957).

Equally, an early account of a garter snake mass mating was one of two serpent-king reports penned by the quasi-anonymous 'E.L.' (*American Naturalist*, 1880). Both encounters had taken place during the early spring, in expanses of Maryland wilderness.

> I first saw such a bundle of snakes in the neighbourhood of Ilchester, Howard Co., Md., on the stony bank of the Patapsco river, heaped together on a rock and between big stones. It was a very warm and sunny location, where a human being would scarcely disturb them. I reasoned that the warmth and silence of that secluded place brought them together. Some hundreds of them could be counted, and all of them I

> found in a lively state of humor, hissing at me with threatening glances, with combined forces and with such a persistency that stones thrown upon them could not stop them or alter the position of a single animal. They would make the proper movements and the stone would roll off. All the snakes in this lump were common snakes (*Eutoenia sirtalis* L.). The second time I noticed a ball of black snakes (*Bascanion* [now *Coluber*] *constrictor* L.) rolling slowly down a steep and stony hillside on the bank of the same river, but about two miles above Union Factory, Baltimore county, Md. Some of the snakes were of considerable length and thickness, and, as I noticed clearly, kept together by procreative impulses.

In Britain, adder aggregations are sometimes met with, again newly emerged from hibernation (often communal); encounters with serpent-kings of this type no doubt contributed to the adder-stone legend.

As Sherman Minton and Harold Heatwole reported in *Oceans* (April 1978), the yellow-bellied sea-snake *Pelamis platurus* is well-known for congregating in immense numbers, often several thousand at a time, passively drifting at the Pacific Ocean's surface, and carried by wind and wave for great distances. The sea-snake serpent-king *par excellence*, however, was witnessed sometime before 1932 by Willoughby P. Lowe, a collector of natural history specimens for the British Museum. As recorded in *The Trail That is Always New* (1932), Lowe was aboard a steamer travelling in the Malacca Strait between the Malay Peninsula and the Indonesian island of Sumatra, when:

> After luncheon on 4 May I came on deck and was talking to some passengers, when, looking landward, I saw a long line running parallel with our course. None of us could imagine what it could be. It must have been four or five miles off. We smoked and chatted, had a siesta, and went down to tea. On returning to the deck we still saw the curious line along which we had been steaming for four hours, but now it lay across our course, and we were still very curious as to what it was. As we drew nearer we were amazed to find that it was composed of a solid mass of sea snakes, twisted thickly together. They were orange-red and black, a very poisonous and rare variety known as Astrotia stokesii [heaviest of all sea-snakes and measuring up to 6 ft long] ... Along this line there must have been millions; when I say millions I consider it no exaggeration, for the line was quite ten feet wide and we followed its course for some sixty miles. I can only presume it was either a migration or the breeding season ... it certainly was a wonderful sight.

The spectacle of millions of extremely poisonous serpents heaving and writhing in a solid, 60-mile-long mass at the ocean's surface may not, of course, be everyone's idea of a wonderful sight, but it definitely merits inclusion in any book dealing with extraordinary animals! (Incidentally, a piscean parallel to serpent-kings is the occurrence of eel kings – see Chris Moriarty's *Eels*, 1978 – comprising tightly entwined balls of pre-migrating eels, occasionally spied floating along streams.)

19 *Shoebill, Hammerhead, and Boatbill – Three Overtly Odd Birds*

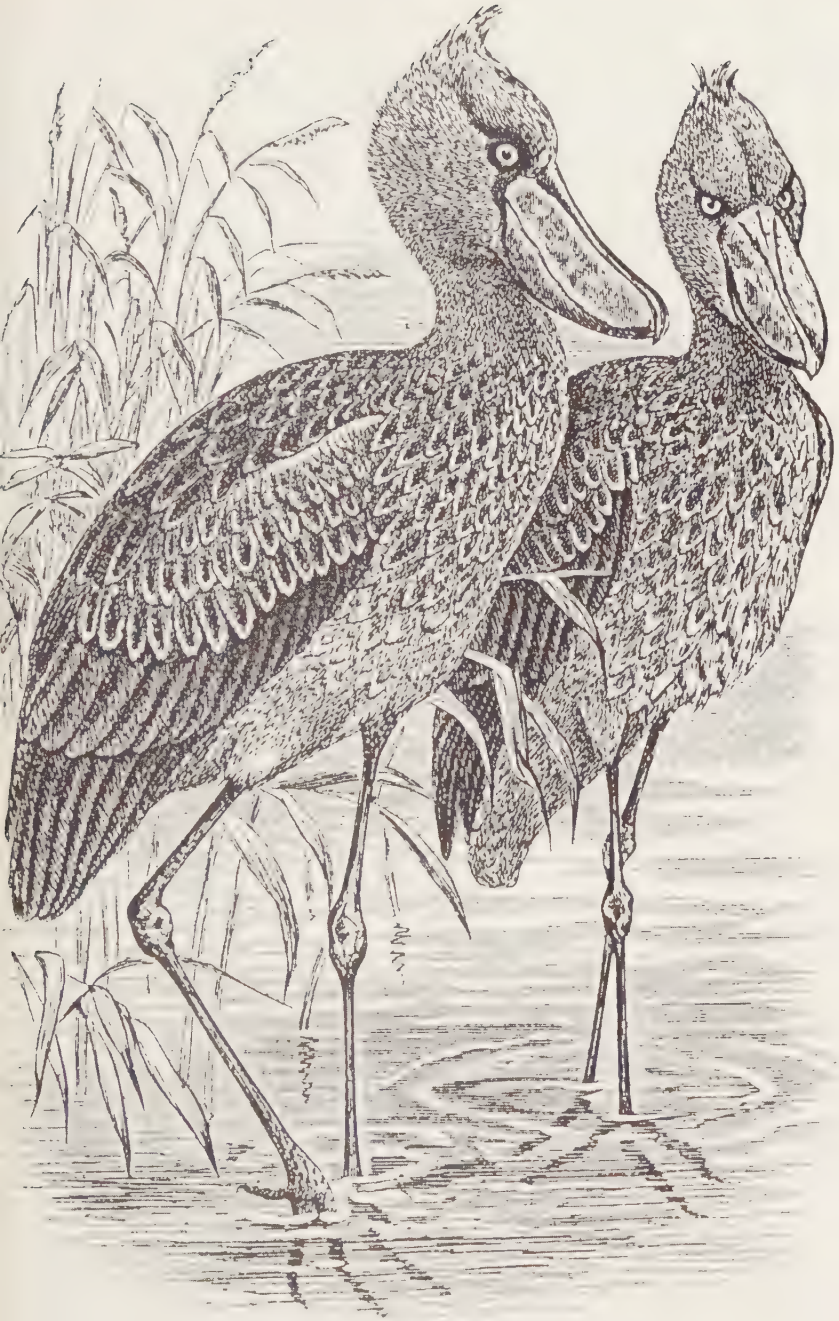
> A creature which resembles a very marvel of fairy-land – I mean *Balaeniceps rex* ... a name as remarkable as the bird itself, which it has earned from the atmosphere of fable with which it is surrounded, owing to its fantastic form – 'the whale-head' and 'king!' – and verily with him the innermost and obscurest realm of the world is revealed.
>
> Dr Alfred Edmund Brehm, *Bird Life*

Ciconiiformes is the scientific order of birds housing such familiar forms as the herons, egrets, and bitterns; the ibises and spoonbills; and the storks. It also houses three species so unusual that they cannot be easily allied either with any of the afore-mentioned birds or with one another, and have successfully baffled and bewildered ornithologists ever since they first became known to science.

Shoebill

Perhaps the oddest of this tantalizing trio is *Balaeniceps rex*, the 'whale-headed king' – though as its head bears little resemblance to a whale, this is a somewhat strange name, even for as strange a bird as *Balaeniceps*. Standing at least 3 ft high, its general appearance is that of a large, round-shouldered stork with slate-grey plumage and an untidy crest, but distinguishing it instantly from any genuine stork is its enormous, grotesque bill. Roughly 8 in long, almost the same in width, and with a sharply hooked tip, this incongruous structure greatly resembles a clog-like shoe, earning *Balaeniceps* a much more apt and more commonly used name – shoebill. Similarly, the Arabs call this bird *Abu-markub*, 'Father of the shoe'.

A shy inhabitant of the relatively inaccessible papyrus marshes and floating swamps of the Upper Nile and its central East African tributaries, the shoebill uses its massive beak to catch and extract prey such as fish, water snakes, and frogs (possibly even small mammals and young crocodiles too) from the surrounding vegetation. It was once believed that its shoe-like shape was a specific adaptation for scooping lungfishes out of the mud, but as lungfishes do not form this species' principal diet, that idea seems unfounded – just as unfounded, it would appear, as many of the assumptions put forward over the years concerning this species' scientific affinity to other birds.



Shoebill – the extraordinary 'whale-headed king'

Science first became aware of the shoebill in the early 1840s. In his *Expedition to Discover the Source of the White Nile in the Years 1840, 1841* (1849), explorer Ferdinand Werne reported that on 15 December 1840 his party observed a remarkable bird that seemed to them to be as large as a young camel, with a huge pelican-like bill, but lacking the pelican's characteristic pouch. This was undoubtedly a shoebill; sadly, Werne was asleep at the time, and his party was unwilling to wake him, so he never saw it himself. Eight years later, however, Baron F.W. von Müller was more fortunate, catching sight of two shoebills. Moreover, upon his return to base at Khartoum, he saw a pair of dead specimens for sale, offered by a slave-dealer. The price that he was asking was too high to interest Müller, but not long afterwards they were purchased by a traveller from Nottingham named Mansfield Parkyns, who brought them back to England when he returned with various other animal specimens collected during his African sojourn. These were studied by the eminent bird painter John Gould, who prepared a formal scientific description of the shoebill, presented on 14 January 1851 at a meeting of London's Zoological Society and published later that year in its *Proceedings*. And in 1860, Britain's first pair of living shoebills arrived at London Zoo.

Meanwhile, the controversy concerning this species' relationship to other birds had begun in earnest. Gould had classified it as an aberrant, long-legged pelican; other ornithologists did not agree with that, and tended to ally it either with the herons or with the storks. Today, the shoebill is conventionally placed between these latter two families, but within neither, as the sole living occupant of its own. The reason for the phenomenal difficulty in satisfactorily classifying this bird rests with its anatomy and behaviour, which embrace a perplexing potpourri of features drawn from at least three different bird families.

Powder-downs are pairs of strange feathers that are never shed, but perpetually fray at their tips to yield a powder that the bird rubs into its other feathers. Herons have three pairs, and the shoebill has a single pair, but storks have none. Also in common with herons, the shoebill's rear toe is held at the same level as its three forward-pointing toes (the rear toe is raised in storks); and when it flies the shoebill tucks its head and neck backwards, like herons once again.

Yet whereas in herons the stapes (the only middle-ear bone in birds) is primitive in form, Dr Alan Feduccia has shown that it has an identical, derived shape in the storks and the shoebill (*Nature*, 21 April 1977). Also agreeing with the storks, the shoebill's middle toe is less than half the length of the tarsus (heel-bone); and, again like the storks, it has no webbing between its toes (herons have a partial web between 2–3 of theirs). It displays the storks' bill-clattering behaviour too.

Yet as if all of this were not already sufficient to demonstrate the shoebill's transitional form and conduct, its skull exhibits certain features similar to those of a completely separate order of birds, the pelicans; furthermore, in true pelican style, it flies with its large beak resting on its breast. Indeed, in 1957 the detailed skeletal studies undertaken by former British Museum ornithologist Dr Patricia A.

Cottam on the shoebill convinced her that Gould had been correct all along, that this enigmatic species really was most closely related to the pelicans. However, other researchers (most recently Dr Joel Cracraft in *Auk*, 1985) dismissed its similarities as examples of convergence, i.e. they reasoned that because the shoebill and the pelicans exist in similar habitats and have similar lifestyles, they have evolved into similar forms, even though they originate from separate ancestral stocks.

Then in February 1986, after having directly compared the shoebill's basic genetic material (DNA) with that of herons, storks, and pelicans, researchers Drs Charles G. Sibley and Jon E. Ahlquist announced in *Scientific American* that, contrary to all expectations, the shoebill's DNA most closely matched that of the pelicans! This provides persuasive evidence for believing that, just as Gould had proposed over 130 years ago, the shoebill is truly an aberrant pelican, and that its cranial affinities with pelicans signify direct kinship rather than deceptive convergence.

Intriguingly, even the shoebill's fossil antecedents have stimulated taxonomic turmoil. Until its reclassification by Dr Pierce Brodkorb in 1980 as an ancestral shoebill, *Goliathia andrewsi* (first described in 1930 by K. Lambrecht and based upon an Eocene-dated ulna bone from Fayum, Egypt) had been classed as an aberrant heron.

Additionally, the shoebill has been implicated in a very curious case of mistaken identity. From time to time reports emerge from various remote regions of Central Africa describing alleged sightings of large, macabre-looking creatures soaring through the skies and bearing an impressive resemblance to those long-extinct flying reptilians called pterosaurs. However, as noted by zoologist Dr Maurice Burton (*Animals*, 18 February 1964), it is more than likely that these refer to shoebill sightings. There is no doubt that this strange bird has a distinctly prehistoric appearance, especially when viewed in flight, and anyone unfamiliar with the striking spectacle of its huge, 8½-ft wingspan and giant bill could certainly be forgiven for thinking that they had spied an aerial anachronism, a cryptic creature supposedly dead for more than 64 million years.

Hammerhead

Just under 2 ft in total length and resembling a short-legged, stocky heron with sombre earth-brown plumage, the hammerhead (or hamerkop in Afrikaans) derives its name from its long, backward-pointing crest which, carried horizontally, resembles the nail-pulling end of a claw hammer. Moreover, as its crest and its large pointed bill collectively resemble the outline of an anvil, this peculiar bird is also known as the anvil-head.

The hammerhead was first discovered in the mid-1700s in Senegal, by the French traveller Adanson, and was scientifically described in 1760 by Brisson, who christened it *Scopus umbretta* – 'with broom and small shade'. Explaining this seemingly odd choice of name, the hammerhead's bushy crest reminded Brisson of a broom, whereas,

Hammerhead – Africa's mysterious lightning bird

somewhat curiously, its crest *and* bill reminded him of a small sunshade! Any mystery regarding its name, however, pales into insignificance in comparison with the mystery still surrounding its precise relationship to other birds. Just like the shoebill, it embodies an ambiguous assemblage of characters that at the same time link it to and separate it from both the heron family and the stork family.

Its heron-like attributes include the incomplete encircling of its bronchi (air tubes) with cartilage – the gaps are sealed with membrane; the pectinate (comb-like) shape of its middle toe's claw; and its rear toe's alignment at the same level as its forward-pointing ones. Notwithstanding these, its lack of powder-downs suggests an affinity with storks, as does the extension of its neck in flight; moreover, as shown in 1972 by Sibley and Ahlquist, electrophoretic examination of its egg-white proteins also reveals a correspondence with storks. Yet the hammerhead's general behaviour is neither heron-like nor stork-like. And its parasitic lice (useful indicators of evolutionary

affinity between species, as closely related host species often have closely related parasites) are most similar to those of plovers, birds belonging to an entirely different order. Some workers suggest that its nearest relative is the shoebill, but as no one can classify that either, this is not particularly illuminating!

Until fairly recently, the hammerhead's fossil ancestry was unknown, but in 1984 Dr S.L. Olson documented an early Pliocene representative, named *Scopus xenopus*, from Langebaanweg, in South Africa's Cape Province.

A widely distributed species along the riverbanks, ponds, and marshes of tropical Africa and also Madagascar, the hammerhead is famous for boisterously cavorting in wild, highly vocal display dances when associating in small flocks during the breeding season, which varies from one locality to another. Otherwise it is a rather silent, unassuming bird, spending its time patrolling the shallow waters of ponds in search of fishes, amphibians (especially the clawed toad *Xenopus*), water insects, and the occasional snail or worm, which it hunts by disturbing the mud at the bottom of the pond with its feet or beak (which is slightly hooked).

Curiously, the hammerhead has inspired a wide array of superstitions and legends. For example, in certain parts of its range it is referred to as the lightning bird, because the local tribes attribute it with the power to invoke terrifying storms at will, and they are also convinced that it can command floods and control the rain. Another of its titles is 'the King of Birds', because the natives widely believe that other birds help it to build its nest, by bringing it offerings of twigs and leaves. This odd idea probably stemmed from the enormous size of the hammerhead's nest – which measures up to 4½ ft in breadth and 6 ft in height, weighs as much as 200 lb, and is sufficiently capacious to house a man. It does seem hard to believe at first that this immense edifice could be constructed by two such modest-sized birds as a pair of hammerheads, yet there is no scientific evidence at all to support the claim that they receive assistance from other species. Ironically, the very reverse is true. As disclosed in a superb Anglia TV film entitled *The Legend of the Lightning Bird* (first shown in Britain on 20 April 1984), other birds frequently take pieces *away* from the hammerhead's nest to use in their own!

Another local belief, vehemently affirmed by the Xhosa, is that this prodigious nest is divided internally into three distinct 'rooms' – a bedroom for hatching purposes, a dining room for feeding and food storage, and a general hallway. This was also seriously subscribed to by many renowned scientists at one time, including Dr Richard Lydekker (in *The Royal Natural History*, 1894–6), but although observations have since confirmed that there are various partitions and ledges inside the nest, there is no evidence for the existence of discrete rooms. Equally, there is no proof that the hammerheads store food inside the nest.

Finally, this species has a widespread reputation as a harbinger of doom, presumably because of its somewhat sinister appearance when poised motionless at the side of a pool – a dark, sombre silhouette, with

its unique hammerheaded outline. Indeed, it is a bird of such ill omen that many locals will desert their homes or villages if a hammerhead should as much as fly overhead! This notoriety is totally undeserved, because the hammerhead is a thoroughly harmless, inoffensive species – normally; Nos. 124 and 126 of the *Witwatersrand Bird Club News* contain reports of hammerheads aggressively seeing off various birds of prey! Nevertheless, it is no bad thing for it to be burdened with such a reputation. This actually operates in the bird's favour – as natives consider it highly unlucky to hurt or kill a hammerhead, the species enjoys a protected existence, exempt from the depredations of humankind.

Boatbill

Present throughout Central America and northern South America, and named by Linnaeus in 1766, the boatbill *Cochlearius cochlearius* is a little like a night-heron, with its black crown and crest, pale silvery-grey body plumage, and an overall length of roughly 2 ft. Yet unlike night-herons (and also herons of any other kind), the boatbill has four pairs of powder-downs instead of only three, and nine primary wing feathers rather than ten. Most distinctive of all, however, is its highly unusual bill. Measuring 3 in long and 2 in wide, this proportionately large, broad structure resembles a sturdy scooping instrument, totally unlike the slimmer bills of other herons. Superficially, it recalls the shoebill's, but whereas the latter bird's is concave on top, sloping inwards, the boatbill's is convex on top, rising upwards, rather like an upturned boat – hence the bird's name.

Its specialized, highly modified form implies that the boatbill's beak must have a very precise function, but to date little is known concerning this, as the bird's feeding habits remain largely a mystery. One might expect such a bill to be used as a scoop, ladling sluggish, inactive prey from the ample supplies of mud in the mangrove swamps which are the boatbill's favoured habitat. Yet there are reports of boatbills feeding upon highly mobile creatures, such as fishes, frogs, and even mice. How could it catch such fast-moving animals with such a cumbersome bill? Faced with these paradoxes, some researchers have suggested that the boatbill's extraordinary beak has nothing to do with its feeding habits at all, having evolved instead for display purposes during the breeding season, but most workers support a feeding role for it.

In recent years, observations of boatbill activity in the wild have revealed that it is largely nocturnal – indicated morphologically by its unusually large eyes – and that it may well hunt primarily by touch rather than by sight. It can be envisaged that a notably large, broad bill would be much more efficient than a short, slender one in bringing the bird into contact with aquatic prey. So perhaps this is the correct explanation for this species' unique bill – it has evolved to maximize the prey-capturing success of a bird that does not detect its prey *directly*, by

Boatbill – what is the function of its strange beak?

observing it, but instead by making physical contact with it.

In view of its very odd bill, as well as the differences from other herons noted earlier, the boatbill has been allocated a family of its own, and has even been allied with the shoebill. Nevertheless, the presence of powder-downs (albeit of an atypical number), a pectinate claw on the middle toe of each foot, and an overall anatomy most closely corresponding to the basic heron condition, have satisfied many ornithologists recently that it is sufficiently similar to warrant inclusion *somewhere* within the heron family. Nevertheless, whereas certain workers categorize it as a highly specialized offshoot from the night-herons, Dr Frederick H. Sheldon's DNA hybridization studies indicate that it is most nearly related to the tiger bitterns (*Tigrisoma*), constituting with *Tigrisoma* a separate group from all other species included within the heron family (*Auk*, 1987).

A heron, therefore, it may be, but the boatbill is evidently no less contentious than are the shoebill and hammerhead – truly, three overtly odd birds!

20 *Rhino Riddles*

> Words can convey but a very confused idea of this animal's shape: and yet there are few so remarkably formed.
>
> Richard Cope, 'The Rhinoceros', in *Natural History*

It is well known that the alleged aphrodisiac properties of their horns are responsible for the relentless and continuing persecution that has brought most rhinoceros species to the very brink of extinction in modern times. Less well known, however, is that these much sought-after structures have also generated all manner of mysteries and controversies for rhino researchers over the years.

Science currently recognizes five present-day species of rhino. These are: the African black or round-lipped *Diceros* (originally *Rhinoceros*) *bicornis* (2-horned); African white or square-lipped *Ceratotherium* (originally *R.) simum* (2-horned); great Indian *R. unicornis* (1-horned); Javan *R. sondaicus* (1-horned); and Sumatran or hairy *Dicerorhinus sumatrensis* (2-horned). However, little more than a century ago a number of additional species were also recognized, because of their various horn-related characteristics. Furthermore, it has been suggested that certain mysterious rhino forms – with unexpected horn complements or other strange features, and whose existence is currently based upon only anecdotal evidence – may actually represent unknown species, still awaiting formal scientific acceptance and description.

Holmwood's Rhinoceros and Oswell's Rhinoceros

One of the principal reasons for the taxonomic tribulations caused by rhino horns is their wide variation in size – especially with regard to the black rhinoceros. The average length for this species' anterior horn (borne upon its skull's nasal bones) is generally 20–32 in, whereas that of its posterior horn (borne upon its skull's frontal bones) is usually 14–16 in. Nevertheless, much longer examples have also been recorded, particularly from female specimens.

During the nineteenth century, F. Holmwood purchased two rhino horns from a Zanzibar dealer that were so long that some authorities believed them to be from some totally new species, duly christened Holmwood's rhinoceros, whereas various others considered them to be from a white rhinoceros. After a detailed study of their form, however,

Dr Richard Lydekker identified them as black rhino horns (*The Field*, 24 July 1909).

Another equally odd African species, described at much the same time, was named *R. oswelli*, Oswell's rhinoceros. Characterized by an anterior horn that pointed forward (and occasionally even downward), it was finally recognized to be nothing more than an accidental or local variety of the southern white rhinoceros *C. simum simum*; the first horns attributed to 'Oswell's rhinoceros' had been obtained near Lake Ngami, Botswana.

The Blue Rhinoceros

Yet another mysterious African rhino mentioned in most natural history tomes during the 1800s was the exotic-sounding blue rhinoceros (also referred to, rather more mundanely, as Sloan's rhinoceros or the keitloa). Known scientifically as *R. keitloa*, this was a relatively rare form, distributed sparingly south of the Zambezi, and not usually gregarious. In his *Illustrated Natural History* (1859–63), Revd J.G. Wood noted,

> The keitloa can readily be recognised by the horns, which are of considerable length, and nearly equal to each other in measurement. This is always a morose and ill-tempered animal, and is even more to be dreaded than the borele [black rhino], on account of its greater size, strength, and length of horn. The upper lip of the Keitloa overlaps the lower even more than that of the borele; the neck is longer in proportion, and the head is not so thickly covered with wrinkles.

Formidably belligerent it may be, but some naturalists considered its credentials as a distinct species to be rather less impressive. W.B. Dawkins and H.W. Oakley, for example, within Prof. P. Martin Duncan's *Cassell's Natural History, Vol. 2* (1883–9), commented that the blue rhinoceros or keitloa differed little from the black rhino, except for the shape of the head,

> . which is somewhat shorter and broader, and it has a less prehensile lip. Its chief characteristic is the posterior horn, which is flattened at the sides, being of almost equal length to the anterior, and even occasionally longer, twenty inches and twenty-two inches being about the average.

A short-lived controversy ensued during the second half of the 1800s, which was finally ended by the famous explorer Captain Frederick Selous. In a comprehensive paper published in the Zoological Society of London's *Proceedings* for 1881, and referring to an extensive collection of horns, Selous demonstrated that blue and black rhinos belong to the same species. As noted in *Rhinos – Endangered Species* (1987) by Malcolm Penny, the difference in horn lengths was most probably due to environmental conditions: black rhinos inhabiting relatively dry

Blue rhinoceros – not a separate species after all

localities are smaller and tend to possess shorter horns than those frequenting wetter terrain. Exit the blue rhinoceros!

Rhinos with Extra Horns

Intraspecific differences in *size* are not the only sources of variation and mystery with rhino horns. Many records exist of specimens of two-horned species that actually possessed *extra* (supernumerary) horns. It is well known, for example, that three-horned black rhinos were once relatively common around Zambia's Lake Young, and details of Botswanan examples are contained in C.J. Anderssons's book *Lake Ngami* (1851). In the past, Sumatran natives asserted that three-horned specimens of the Sumatran rhinoceros were occasionally met with too. Even Linnaeus mentioned three-horned rhinos – to his description of the black rhinoceros in Gmelin's edition (1788) of *Systema Naturae* is

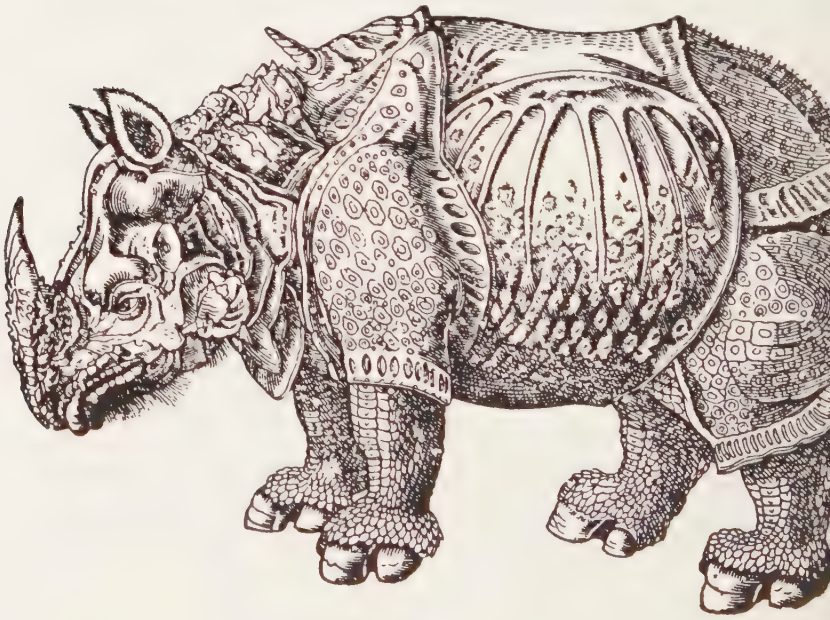
added, 'Rarior est Rhinoceros tricornis, tertia cum cornu ex alterato priorem excrescente'.

In most cases, the extra horn is usually nothing more than a small, rounded knob – a rudimentary third horn positioned behind the two normal ones. However, towards the end of the nineteenth century, London Zoo exhibited a female great Indian rhino that bore a rudimentary second horn upon her forehead.

Occasionally, even more extreme cases are recorded. One such individual was the abnormal black rhino shot in August 1904 in dense covert west of Kenya's Jambeni Mountains, and reported by Colonel W.H. Broun in the Zoological Society of London's *Proceedings* in 1905. In addition to the two normal representatives, this rhino had a third, rudimentary horn between its ears, and a *fourth*, equally diminutive example located about 4 in further back.

During his extensive black rhino researches, renowned German zoologist Dr Bernard Grzimek encountered reports of a five-horned specimen, and even of rhinos with horns growing out of their bodies. Moreover, he suggested that the famous illustration by Albrecht Dürer (later copied by Conrad Gesner in his *Historiae Animalium. Liber* I, 1551) of a great Indian rhino bearing an incongruously sited horn on its shoulder may have been truly based upon an abnormally horned specimen. At one time, this idea was discounted in favour of the theory that the horn was either an error, or merely an excrescence developed by the rhino in question during its long confinement in the ship bringing it from India to Portugal's King Manuel the Great, at Lisbon. Moreover, as discussed in an entire paper on the subject by Dr K.C.A.

Dürer's famous shoulder-horned rhinoceros



Schulz (*African Wild Life*, 1961), rough sores of a horny nature have been observed for some time among black rhinos too. However, Grzimek's view was reinforced in spring 1968, when Prof. Heini Hediger photographed a white rhino living in San Francisco Zoo that bore a bona fide, unequivocal shoulder horn, measuring in height some 4 in (*Zoologische Garten*, Leipzig, 1970).

At present, the precise reasons for the development of extra horns by rhinos remain relatively unclear. In some cases, a genetic origin is indicated, especially when they involve several multi-horned specimens inhabiting one specific locality, as with the Lake Young individuals. Injury-induced development (echoing the 'excrescence theory' for Dürer's specimen) may also occur – as documented from various antelopes and deer possessing supernumerary (and often oddly located) horns, sometimes emerging from the forehead, face, or even sites on the body (see also the horned jackal, Chapter 22).

Rhinos with Fewer Horns than Normal

At the opposite extreme, records also exist of hornless rhinos (indeed, hornless females of the Javan rhinoceros were quite common prior to the species' modern-day decline), and of specimens of two-horned rhino species that only have a single horn.

For example, Charles Knight in his *Pictorial Museum of Animated Nature* (1856–8) states,

> ... there is some reason to believe in the existence of a single-horned species in that region [Ethiopia]. Bruce states that a one-horned rhinoceros is found towards Cape Gardafui, according to the account of the natives in the kingdom of Adel. Accounts of such an animal were received by Dr Smith from the natives in the interior of South Africa, who represented it as living far up the country; moreover Burckhardt alludes to a one-horned species in the territory above Sennaar, and states that the inhabitants there give it the name of the 'mother of the one horn'. According to this traveller, its northern boundary, like that of the elephant, is the range of mountains to the north of Abou Huaze, two days' journey from Sennaar. The hide of this animal is manufactured into shields, which have an extensive sale; the material of the horn is also sold, and at a high price. Burckhardt having seen four or five Spanish dollars paid for a piece four inches long and one inch thick ... it may be added that Dr Smith adduces the testimony of Mr Freeman respecting an animal by no means rare in Makooa, north of the Mosambique Channel, which, overlooking the absurdities and exaggeration of the description, he suspects to be a one-horned rhinoceros, and probably that of which he heard, and which may extend to the countries mentioned by Bruce and Burckhardt.

'Dr Smith' was Sir Andrew Smith, whose investigations are documented fully in his *Illustrations of the Zoology of South Africa, Vol. 1* (1838). Ten years later, similar reports, but this time emanating from the Lake Chad district and the White Nile, were presented by F. Fresnel (*Comptes Rendus*, 1848). What could these one-horned rhinos be?

In some cases, they may have been based upon sightings of black or white rhino specimens in which one horn had been lost through injury. However, as pointed out by Lydekker (*The Field*, 28 December 1907), records exist of white rhinos that have never developed a true posterior horn, bearing nothing more than an inconspicuous tubercle behind the front horn, so that to all intent and purposes these individuals really are one-horned. There is a further, if rather more remote, explanation of one-horned rhino sightings in Africa – that they represent a distinct species still undescribed by science. If true, it is likely now that it will remain undescribed indefinitely, as rhinos no longer exist in most of the northern regions noted in the above narratives.

The Badak Tanggiling – a Sumatran Surprise

In 1941, Willy Ley noted in *The Lungfish and the Unicorn* that at some stage during the middle portion of the 1920s, a Dr Vageler – regularly contacted by zoos wishing to replenish their animal collections – was seeking some specimens of the Asian rhinos when he met up with J.C. Hazewinkel, a noted big game hunter. After learning that Vageler required new rhinoceroses, Hazewinkel showed him some photos of eight that he had shot in Sumatra, and which appeared to be new in every sense of the word. For the type that they represented – although familiar to the natives, who called it *badak tanggiling* – seemed to differ greatly from the form familiar to Vageler on Sumatra.

Unlike the known, two-horned Sumatran rhinoceros *Dicerorhinus sumatrensis*, the *badak tanggiling* bore just a single horn. If this had been the only difference, it could have been explained as a mere freak of nature. However, Hazewinkel stated that the female *badak tanggiling* was often totally hornless, and that the form as a whole attained a length of 10 ft. In contrast, the female Sumatran rhinoceros is rarely if ever hornless, and the species as a whole only attains a length of 8–9 ft.

As Dr Vageler readily recognized, the Sumatran rhino thus became an unlikely candidate for the *badak tanggiling*'s identity. In his coverage of this episode, Willy Ley stated that Hazewinkel's photos convinced Vageler that a second species of rhinoceros existed on Sumatra, and that in reply to his requests Vageler was promised living specimens of it to send on to various zoos worldwide, but they never arrived. Ley concluded his account by stating that the *badak tanggiling* therefore remains a shadow in our zoological encyclopedias, but 'it may, however, be rediscovered almost any day'.

From all of this it would seem that Ley considered the *badak tanggiling* to be a wholly unknown, undescribed species. In fact, its identity is surely no mystery, for this enigmatic creature is almost certainly *Rhinoceros sondaicus*, the Javan rhinoceros. Not only is it of comparable size to the *badak tanggiling*, and a one-horned species whose females are indeed sometimes hornless, but at the time of Vageler and Hazewinkel it did exist on Sumatra (but this was not widely known outside scientific circles). Indeed, the last known Sumatran specimens of the Javan rhino did not die out until World War II.

There is a further, more specific, piece of evidence in favour of this identification. On 23 December 1933, the *Illustrated London News* published an article by Hazewinkel, in which he described his pursuit and shooting of the first of eight specimens of large, one-horned rhinoceros on Sumatra during the mid-1920s. The photos of the animal dispel any doubt as to its identity – one that Hazewinkel, moreover, freely announced. It was a Javan rhinoceros. Indeed, echoing the general unawareness concerning the existence of this species on Sumatra at that time, Hazewinkel had entitled his article 'A One-Horned Javanese Rhinoceros Shot in Sumatra, Where It Was Not Thought to Exist'.

Clearly, there can be no question that those eight Javan rhinos shot by Hazewinkel on Sumatra in the mid-1920s are one and the same as the eight Sumatran *badak tanggiling* shot by him and mentioned to Vageler by him during that same period.

According to Joseph Belmont, another animal collector for zoos, a mysterious beast known as the scaled rhinoceros allegedly existed amidst the inhospitable, fever-ridden swamps of Java. Writing in *Catching Wild Beasts Alive* (1931), Delmont reported that this cryptic creature, supposedly distinct from the known species of Javan rhinoceros, had only been shot twice, with no living specimen ever having been obtained. However, as the 'armour' of the known Javan rhino is noticeably scale-like, quite different from that of its closest relative the great Indian rhinoceros, it would once again seem that the creature in question is *Rhinoceros sondaicus* after all.

Rhinoceroses in New Guinea and New Caledonia?

As far as science is concerned, the fauna of New Guinea does not include any species of rhinoceros, but that has not prevented the documentation of some interesting reports supporting the existence of supposed rhinos on this island. For example, on 28 January 1875, *Nature* published an intriguing account from Alfred O. Walker.

> Lieut. Sidney Smith, late of HMS *Basilisk*, reports that while engaged in surveying on the north coast of Papua, between Huon Bay and Cape Basilisk, being on shore with a party cutting firewood, he observed in the forest the 'droppings' (excrement) of a rhinoceros in more than one place, the bushes in the neighbourhood being also broken and trampled as if by a large animal. The presence of so large an animal belonging to the Asiatic fauna in Papua is an important fact.

It is indeed – if true. However, the *Nature* editors were not so readily convinced, adding in a footnote that they were '... inclined to doubt very seriously the occurrence of any rhinoceros in New Guinea'. Notwithstanding this, the very next *Nature* (4 February 1875) featured a thought-provoking report by zoologist Dr Adolf Bernhard Meyer, which included the following details:

> I am quite of your opinion that the occurrence of a rhinoceros in New Guinea is *very seriously* to be doubted ... but I beg leave to mention a report of a *very large quadruped* in New Guinea, which I got from the Papuans of the south coast of the Geelvinks Bay ... when hunting wild pigs along with the Papuans, they told me, without my questioning them, of a *very large pig*, as they called it, fixing its height on the stem of a tree at more than six feet. I could not get any other information from them, except that the beast was very rare, but they were quite precise in their assertion. I promised heaps of glass pearls and knives to him who would bring me something of that large animal, but none did. I cannot suppose, so far as my experience goes, that the Papuans are remarkably prone to lies; notwithstanding I seriously doubted the existence of such a large 'pig' ... It is true this statement does not strongly support Lieut. Smith's *aperçu*, but the one gains a grain by the other; I mean, the probability of the existence of a large quadruped in New Guinea increases a shadow.

It was increased a further shadow in the same *Nature* issue, courtesy of a second, longer letter from Alfred Walker, containing extra details supplied by Lieut. Smith.

> The heap of dung first seen, which was quite fresh (not having apparently been dropped more than half an hour), was so large that it excited Mr Smith's curiosity, and he called Captain Moresby to see it. Neither of them knew to what animal to assign it. Quantities of dry dung were afterwards seen. Shortly afterwards, the *Basilisk* being at or near Singapore, Capt. Moresby and Mr Smith paid a visit to the Rajah of Johore, who had a rhinoceros in confinement. Mr Smith at once observed and pointed out to Capt. Moresby (who agreed with him) the strong resemblance between the dung of this animal and that they had seen in Papua.

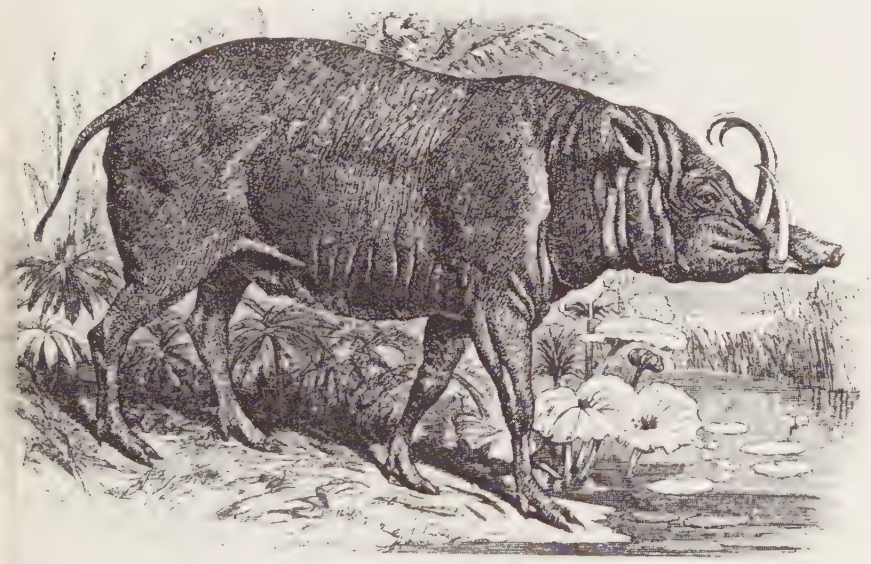
It hardly need be said that heaps of animal droppings rarely arouse such interest unless there really is something very strange about them! And what of Meyer's 'very large pig'? Feral domestic pigs in New Guinea rarely exceed 2½ ft at the shoulder.

Meyer's report recalls a comparable one from Papua pioneer Charles A.W. Monckton's *Last Days in New Guinea* (1922), repeated in Edmond Demaitre's *L'Enfer du Pacifique* (1935). During an expedition led by Monckton in 1906 through the jungle near New Guinea's Mount Albert Edward, two of the team's native members, Private Ogi and Village Constable Oina, were sent on ahead to find out whether a newly discovered trail was negotiable. When they did not come back, the team became anxious and fired a number of shots to signal them to return to camp immediately, but no-one appeared. Eventually, however, sounds of gunfire reverberated from the jungle depths, so a party set off in their direction and brought the two men back, with Ogi in a very agitated state. Apparently, Ogi and Oina had become separated from one another while investigating the trail, and during his subsequent wanderings Ogi had come face to face with a pair of very large and extremely unusual animals – animals that he referred to as 'devil-pigs'!

They were allegedly 5 ft long and 3½ ft high, with cloven feet but a horse-like tail, a black or very dark-coloured hide, and, strangest of all,

a very long nose. Ogi tried to shoot at one, but was so cold and afraid that his hands shook, causing him to misfire. What happened after that is not clear – whether Ogi chased the beasts or whether they chased him is not known – but he was finally located in an exhausted state by Oina.

Drily nicknamed 'Monckton's gazeka' by certain writers, the devil-pig was also alluded to briefly in Sir William MacGregor's Mount Scratchley Expedition report. It does not seem to be a rhino; its cloven feet, tail, and long nose recall the large, distinctly odd wild pig of Sulawesi (Celebes), the babirusa *Babyrousa babyrussa* – famed for its extraordinary tusks. Except for its feet, it also has similarities to the Malayan tapir *Tapirus indicus*, one of those strange relatives of horses with slender trunks and usually very dark, virtually black hides. True, this particular species has a 'saddle' of white, but some all-black Malayan specimens have also been recorded (and even kept in zoos). No tapirs, however, have ever been discovered in New Guinea.



The bizarre babirusa of Sulawesi

Demaitre succinctly differentiated the devil-pig from any putative New Guinea rhino by noting that although zoologist Luigi d'Albertis and former Papua governor Sir William MacGregor were willing to acknowledge the existence in New Guinea of *some* form of unidentified herbivorous creature, they were *not* willing to believe that it was a rhino. Similarly, when Dr H.J.V. Sody mentioned Lieut. Smith's observations, and requested news of any further data alluding to the possible existence of such a beast (*Zeitschrift für Säugetierkunde*, 1959), Moscow zoologist Prof. W.G. Heptner responded in 1960 by stating

that not a single mention of rhinoceroses was contained within the authoritative six-volume work on New Guinea compiled by eminent researcher Dr M.N. Miklukho-Maklai, who had spent an appreciable amount of time in several different areas of New Guinea at much the same time as Smith was there. Surely, Heptner argued, if such a beast did exist, Miklukho-Maklai would have learned of it from the Papuans. Heptner also noted that the latter's magnum opus did not contain any mention of Meyer's 'very large pig' either.

Overall, there seems to be little support for the occurrence of a rhino species in New Guinea but, Heptner's comments notwithstanding, rather more in favour of a sizeable pig-like or tapir-like beast. Unfortunately, there is one major problem even with these identities. New Guinea's known mammalian fauna is of a predominantly Australian nature, i.e. it is dominated by marsupials. Hence if a large herbivorous mammal does exist in New Guinea, it is most likely to be a marsupial (which pigs and tapirs are not).

This is assuredly why Dr Bernard Heuvelmans has suggested that the *gazeka* may actually be a surviving species of diprotodont – a family of huge marsupial herbivores that 'officially' died out at least 6000 years ago (though there are rumours of similar beasts still existing in Central Australia's inhospitable deserts). Some did have elongate noses. Moreover, certain early stone carvings, discovered in New Guinea's Ambun Valley and traditionally believed to portray this island's long-nosed spiny anteater *Zaglossus*, have recently been likened by renowned palaeontologist Dr J.I. Menzies to a long-nosed diprotodont called *Palorchestes* (*Science in New Guinea*, 1987). Diprotodonts are generally believed to have been contemporary with early man in Australia – there is even a putative painting of one in a remote northern Queensland cave (*New Scientist*, 2 October 1986). If Menzies' tentative identification of the Ambun stones' creature is correct, then this was also true in New Guinea, adding weight to the possibility that some diprotodonts here have even persisted into historic times.

Also of note is that one type of diprotodont, called *Nototherium*, even bore a nasal horn and is actually referred to as a marsupial rhinoceros. Given the persistence of rhino reports from New Guinea, it is odd that references to the possession of *horns* by such beasts are conspicuous by their absence. In view of *Nototherium*, however, even if horns *are* present a diprotodont identity may still apply.

Lastly, the finding of a Pleistocene-dated rhinoceros-like tooth in New Caledonia's Diahot Valley by some gold miners during the 1800s has also inspired longstanding scientific debate. If it really is a rhino's tooth (and not that of a diprotodont, as some researchers suggested in 1981, naming its species *Zygomaturus diahotensis*), it must surely have been brought here from elsewhere by a human agency, because there is no other evidence (so far) to imply the former existence of a rhinoceros species on this island.

Undiscovered Rhinos in the Dark Continent?

There is anecdotal evidence for the presence of several mystery rhinos in Africa. Even before their modern-day persecution, neither of the two accepted species of African rhinoceros was known to occur further to the west than the Cameroons. Yet, as noted in Knight's *Pictorial Museum of Animated Nature* (1856–8), clubs made from rhinoceros horns and measuring about 3 ft in length have been obtained by travellers in Dahomey (since renamed Benin). Had the horns been imported from elsewhere? Or were they from some type of rhino native to Dahomey, whose existence has never been formally recorded?

Equally enigmatic is the pygmy rhinoceros allegedly inhabiting the forests of Liberia, a creature which the locals readily differentiated from the giant forest hog and the pygmy hippopotamus according to Hans Schomburgk (rediscoverer of the latter species in 1912). Furthermore, chief game inspector Lucien Blancou collected several reports (*Mammalia*, 1954) of an even more mysterious, much larger form reputedly dwelling in the dense forests of the Cameroons and around the Middle Congo River. Rather surprisingly, it appears to be somewhat amphibious. And in the Likouala region of the People's Republic of the Congo (formerly the French Congo Republic), an unidentified one-horned beast of elephantine proportions is accredited with a heavy tail (very unlike that of any known rhino), and an unexpected propensity for disembowelling elephants entering its swampy domain. All of this suggests something very different from the rhinos currently recognized by science – so much so that, albeit with notable reservations, cryptozoologist Dr Roy P. Mackal suggested in his book *Mokele-Mbembe* (1987) that it might not be a rhino at all, but instead a surviving ceratopsian dinosaur!

Rhino Rediscoveries

Dinosaur or not, it seems that even after beasts such as the blue rhino, Holmwood's rhino, and Oswell's rhino have been denied the rank of valid species, several other mysterious forms still await identification. Naturally, opponents of such a possibility will immediately reply that it is quite inconceivable that creatures as large and conspicuous as rhinoceroses could still exist unknown, anywhere in this, the twentieth century. Perhaps they should be reminded that Cotton's white rhino *C. simum cottoni* – a distinct Central African subspecies of the world's third largest land mammal – remained undescribed by science until 1901. And as recently as 1983 an entire herd of Sumatran rhinos was discovered in Sarawak (*Oryx*, April 1987); until that remarkable find, this species was believed to have died out here almost forty years earlier. Even more astounding was the rediscovery in 1988 on the Asian mainland, in Vietnam, of the Javan rhino – supposedly extinct there since the early 1940s (*Oryx*, April 1990).

From events such as these, it is evident that the existence of rhinos and rhino-like beasts still to be recorded by modern science is by no

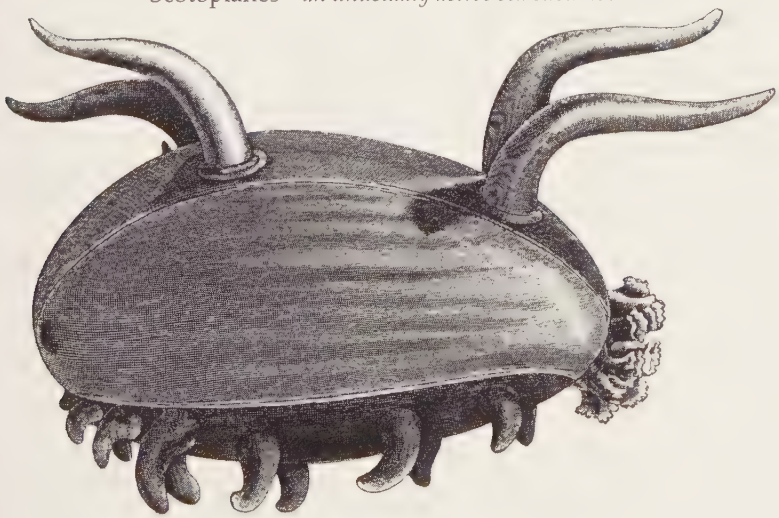
means impossible – especially when, in terms of exploration potential, their habitats include some of the world's most impenetrable, inhospitable, and inaccessible areas.

21 *Secret Lives of the Sea Cucumbers*

> It is a remarkable fact, that when one of the Holothuridae [sea cucumbers] is alarmed, or suffers from indigestion ... it proceeds to disembowel itself, and does so with a completeness and promptitude that are almost incredible. It disgorges the whole of its interior, with all the complicated arrangements that render the Holothuridae such singular beings to dissect, casts away all its viscera, its stomach, and even throws off the beautiful bell of tentacles ... It seems a singular cure for indigestion, but no one can deny its efficacy.
>
> Revd J.G. Wood, *Illustrated Natural History, Vol. 3*

Unlike their more visually impressive relatives, which include the geometrically arresting starfishes, the sinuously delicate brittle stars, and the often spherical, spine-encompassing sea urchins, the sea cucumbers or holothurians rarely rate a second glance from anyone other than those researchers who purposefully choose to study these deceptively leguminous animals. Most of the thousand or so species so far recorded have a long, cylindrically bulbous, armless body, with a thick-skinned wall (served up as the gastronomic delicacy *trepang* in the East) impregnated with tiny spicules of calcite. At one end is the anus,

Scotoplanes – *an unusually active sea cucumber*



at the other a mouth frequently encircled by a ring of extensible tentacles, whose shape, size, and number vary greatly between species and constitute one of the most important morphological features utilized in holothurian classification. Whatever these sluggish denizens of sea beds worldwide may lack in visual appeal, however, they more than adequately compensate for with a repertoire of bewildering and thoroughly bizarre behavioural attributes.

In sea cucumbers, the mouth leads (sometimes via an oesophagus) to a short stomach, and thence to a coiled intestine ending in a special chamber called the cloaca, just to the side of the anus. Also opening into the cloaca is a pair of very unusual organs involved in respiration. Each of these consists of a central trunk, bearing a profusion of thinner branches – indeed, their arborescent appearance is so pronounced that these organs are referred to as respiratory trees. Water is pumped into them via the anus and cloaca, oxygen is extracted, and the water is forced back out again. This is the normal function of these trees, but they can also participate in a much stranger one.

Sea cucumbers belonging to the genera *Actinopyga* and *Holothuria* have many blind-ending tubular structures attached to the base of one or both of their respiratory trees. These are the Cuvierian tubules – skilfully employed by the sea cucumber in its own thoroughly unique *modus operandi* for dealing with any would-be predators. At the latter's approach, the cucumber contracts its body until its cloaca's wall ruptures, then spurts out its Cuvierian tubules *en masse*, entangling its hapless adversary in a sticky snare of adhesive threads. Sometimes the predator can become so hopelessly enmeshed that it drowns; in any event, the sea cucumber's actions grant it sufficient time to make its sluggish escape, either by crawling away or by burrowing into the sea bottom sediment. As for its loss of tubules, this is of no significance, because within a relatively short space of time it will have regenerated another set, ready if need be for a new confrontation.

This startling reaction to predators is sometimes confounded with the superficially similar but even more drastic steps taken when faced with crowded surroundings or polluted water, especially under laboratory conditions. In such a situation these same sea cucumber genera, as well as certain others, not only expel their Cuvierian tubules but also eject one or both of their respiratory trees *in toto*, together with their gonads (reproductive organs) and even their digestive tract, all shooting out of their rear end (though with *Thyone* species, this expulsion occurs via the rupturing of the *front* end). Once again, however, these ousted organs are eventually regenerated, and the entire process, aptly referred to as evisceration, appears to have no ill-effect upon the animals themselves. Indeed, as shown by holothurian researcher Dr E.F. Swan with *Parastichopus californicus*, it seems to be a normal occurrence in some species, induced by natural, seasonal stimuli (*Science*, 7 April 1961).

When they are not ejecting their entrails in what must surely be the most extreme example of spring-cleaning recorded from the animal kingdom, some cucumbers are falling apart – literally. When attacked,

such species undergo self-mutilation, fragmenting into several separate pieces. Whether the predator then eats any of these is of no concern to the sea cucumber, provided that its most anterior piece is not eaten, for this is the one segment capable of regenerating, and if left untouched by the predator it will in time regenerate totally into a complete, fully formed sea cucumber.

During those periods when they are neither bereft of organs nor in pieces on the seafloor, some sea cucumbers are renting out their bodies' internal premises as desirable residences to a variety of other animals. Probably the most interesting and conspicuous of their tenants are the *Carapus* pearlfishes or fierasfers, native to the Mediterranean. When adult, a pearlfish habitually spends its days tucked up inside one of the sea cucumber's respiratory trees, with only its head – which protrudes from the latter's anus – betraying its presence there. At night, it leaves its unexpected hideaway to seek food, but as soon as daytime, or danger, approaches, it returns and re-enters, tail-first (its head would become wedged if it entered head-first). Although somewhat unorthodox, the adult pearlfish's behaviour is often harmless to the sea cucumber; sadly, however, the same cannot be said for that of its juveniles. These enter sea cucumbers head-first (being smaller), and then, showing a distinct lack of respect for their landlords, feed upon their respiratory trees and reproductive organs.

Certain sea cucumbers house a diversity of strange bivalve molluscs within their intestine, and a bizarre parasitic seasnail *Paraenteroxenos dogieli*, completely devoid of internal organs except for those serving reproductive purposes, inhabits the species *Cucumaria japonica*. The body of *P. dogieli* is exceedingly flexible, capable of very extensive coiling, which is just as well, considering that at a total length of 4 ft it is twelve times as long as its 4-in host!

No discussion, however brief, on sea cucumber idiosyncrasy could be complete without mentioning one of the most eccentric sea cucumbers of all. Eschewing the typical arm-lacking, tubular body form, certain deep-sea holothurians exhibit quite extraordinary shapes. Some, like *Deima validum*, are greatly flattened and bear spiny projections around their perimeter like the internal cogs of an old-fashioned clock; *Psychropotes longicauda* resembles a portable vacuum cleaner, complete with handle; whereas *Peniagone vedeli* is irresistibly reminiscent of an animated, many-fingered glove, crawling like a macabre, dismembered hand across the sea bottom. None of these, however, can compare with *Scotoplanes globosa*, best described as an ambulatory haggis!

Sea cucumbers bear tiny but numerous extrusible outgrowths of the body wall called tube-feet, used in locomotion. In *Scotoplanes* these are far fewer in number but much larger in size, and when fully extended by fluid pumped into them from special ventral cavities (in turn achieved by body wall contraction), they are transformed into two rows of dainty legs. As revealed during a photographic census by the US Navy bathyscaphe *Trieste* (*Deep Sea Research*, 1967), it uses these unexpected limbs to scramble across the San Diego Trough's soft

bottom (at a depth of 106 m) like an oddly designed woodlouse, a daringly distinctive holothurian totally at variance with these creatures' slothful, vegetative persona – yet another surprise from the secret world of the sea cucumbers.

22 *The New Guinea Singing Dog, and Other Canine Curiosities*

Canis a non canendo.
[A dog (canis) so called from its not singing (canens).]
Varro, *De Lingua Latina*

One of New Guinea's most intriguing mammals is a dog that *does* sing, or at least yodel – just one of the odd and often controversial canine curiosities included in this chapter.

New Guinea Singing Dog – a Yodelling Dingo?

In addition to the many feral (run-wild) domestic dogs of relatively recent origin and varied appearance present throughout New Guinea, there exists in its eastern highlands a very primitive canine form of much greater antiquity and well-defined morphology. This resembles a small, thickset dingo, not only in general external appearance, but also in relation to certain cranial-dental ratios held to be of significance in canid classification. In 1957, Dr Ellis Troughton, Mammal Curator at the Australian Museum, classed it as a distinct species, dubbing it *Canis hallstromi*, in honour of Sir Edward Hallstrom (President of the Taronga Park Trust), and in an attempt to initiate further studies of this largely ignored form which would determine its precise taxonomic status. Troughton based his description of this new species upon a pair housed at Taronga Zoo.

In 1971 he published another paper treating *C. hallstromi* as a valid species; but two years earlier, following detailed studies of its breeding and offspring, Dr W. Schultz had proposed that it should be incorporated within the domestic dog's species (*Zoologischer Anzeiger*, 1969). This was widely accepted, and today the creature is generally considered to be nothing more than a long-established but taxonomically insignificant feral breed of domestic dog (as is the dingo for that matter). Nonetheless, Troughton's paper remains a very important contribution. It contains the most detailed account of this little-known dog currently available, documents early descriptions, details its relationship with the New Guinea natives (who look upon it as a valued food item) and, most memorable of all, reveals that it does not bark, but gives vent to a curious howling whine instead, likened by

New Guinea singing dog at London Zoo

some other researchers to yodelling. This last-mentioned characteristic has earned *'C. hallstromi'* its most popular English name, the New Guinea singing dog, and has inspired many unusual myths concerning it.

According to some, these animals harbour the souls of dead tribesmen, who communicate with their living relatives via the dogs' yodelling. Moreover, the natives believe that by listening carefully to the specific tones of a given dog, the identity of the dead tribesman speaking with its voice can be instantly recognized. Also, their vocal abilities have inspired a legend in the mythology of Port Moresby's Motu tribe that attributes the gift of speech to these dogs. And in the vicinity of eastern New Guinea's Mount Hagen, the natives imitate this creature's whistling yodels as an effective means of communicating with one another over great distances.

Singing dogs are rarely seen beyond their New Guinea homeland, but on account of their name's musical association a pair was presented during the early 1960s as an undeniably original and delightfully appropriate gift to the eminent conductor Sir Malcolm Sargent, during

one of his Australasian concert tours. Although Sir Malcolm became very fond of them, he had nowhere suitable to keep them, so in 1964 he donated the pair to London Zoo, where he visited them on several occasions thereafter, and where they soon became very popular attractions (raising a litter of cubs, containing some dingo blood). I can still readily recall my own first encounter with the London Zoo singing dogs, as it proved to be quite an unforgettable event.

As a child of about six or seven at the time, I had read all about them in various books and magazines with unbounded fascination, and implored my parents to take me to see these wonderful dogs that could sing. When I reached their enclosure, one of them was at that very moment entertaining an enraptured audience with a thrilling rendition in falsetto fortissimo, so I eagerly thrust my way through the throng to obtain a closer view – a little too close for comfort, as it turned out. I can only assume that its impromptu concert had proven too demanding for its voice, because just as I reached the front of the crowd, the singing dog stopped singing, turned around, and coughed violently and with unerring accuracy directly into my face! Still in a state of shock, I was swiftly dragged away by my mother, who was convinced that I would surely develop some hideous tropical disease. Needless to say, I did nothing of the kind but, not surprisingly, the whole incident remains one of my more vivid if unusual memories of childhood.

Finally, I am greatly indebted to renowned zoologist Dr Desmond Morris, Curator of Mammals at London Zoo during much of the 1960s, for sharing with me the following priceless anecdote concerning these singing dogs. When Spike Milligan visited the zoo one day, Dr Morris showed them to him, and informed him that they belonged to Sir Malcolm Sargent. Spike's opinion, given by way of reply, was, as always, purest Milliganesque: 'Their Bach is worse than their Bitehoven!'

Mount Popa's Mystery Dog, and Australia's Yokyn

Another wild dog of controversial scientific status was a mysterious form discovered on Burma's Mount Popa. In 1936 Reginald Pocock stated that no specimens of the Asian wild dog or dhole *Cuon alpinus* had been obtained from Burma, but shortly afterwards he learnt that a Mr Shortridge had secured a specimen on Mount Popa. Naturally Pocock was anxious to examine this unique example, an adult female, especially as Shortridge alleged that it only had five pairs of teats (female dholes have 6–8 pairs), and weighed only 19 lb (unusually light for a dhole). However, after studying its skull, uncovered at the British Museum, Pocock recognized that it had been nothing more than an old, small domestic dog, with a high crown and short muzzle. But, ironically, genuine Burmese dholes *were* obtained later, and in 1941 Pocock christened their race *C. a. adustus*.

The *yokyn* is a strange dog-like beast reputedly well-known to Australian aboriginals and farmers. Said to have long claws, a stocky build, and a variable (sometimes brindled) coat, a specimen has yet to

be formally examined, so its identity remains uncertain (*Fate*, May 1977). An unknown species, an odd type of feral domestic dog, a dingo, a dog-dingo crossbreed, and even a surviving mainland race of the marsupial Tasmanian wolf *Thylacinus cynocephalus* are among those identities on offer.

Horned Jackals and Reedwolves

One of the most unlikely mystery dogs must surely be the Sri Lankan horned jackal – yet we know that such creatures do exist, because skulls of common jackals *Canis aureus* bearing a small bony horn either at the front or at the rear of the skull have been obtained. A skull with a rear-sited horn was housed in the museum of London's College of Surgeons in the nineteenth century and was depicted in Sir J. Emerson Tennent's *Sketches of the Natural History of Ceylon* (1861), and most recently in an article of mine discussing certain Sri Lankan mystery beasts (*Fate*, January 1989).

According to Sri Lankan lore, only the leader of a jackal pack possesses a horn, referred to as a *narri-comboo* and greatly valued as a lucky charm by the islanders. The mechanism responsible for horn development is currently unknown. A mutant gene could be involved; alternatively, a physical injury may provide the necessary stimulus (the occasional growth of horn-like structures from the site of former injuries has been recorded from a wide range of mammals, including man). However, it would be extremely difficult to postulate *any* mechanism, genetic or environmental, that could limit horn growth *solely* to pack-leaders – this aspect is more likely to be folklore than fact.

The Hungarian reedwolf was a small, mysterious form of wild dog existing in Hungary and eastern Austria until the early 1900s. In 1856, M. Mojsisovics named it *Canis lupus minor*, treating it as a small wolf, but the precise nature of its identity remained a debated issue long after that. In the late 1950s, this extinct enigma inspired a series of interchanges in various journals between Hungarian researchers Drs Eugen Nagy and Janos Szunyoghy. Nagy staunchly supported Mojsisovis's reedwolf classification, but Szunyoghy categorized it as a larger-than-normal version of the common jackal (in 1938, Dr Gyula Éhik had actually renamed it *C. aureus hungaricus*). However, the detailed studies of Prof. Eduard-Paul Tratz with the handful of museum specimens of reedwolf in existence provided persuasive evidence for believing that it had been an unusually diminutive race of wolf after all, an identity that has since won widespread acceptance.

The smallest wolf of all was *Canis lupus hodophilax*, the Japanese *shamanu*; it became extinct around 1905. This grey-haired form was so tiny, with a shoulder height of only 14 in, that in 1970 Dr Yoshinori Imaizumi formally classed it as a distinct species, separated from all other wolves. However, this has not received extensive support, so that most mammalogists still treat the *shamanu* as a miniature subspecies of the common wolf.

British Mystery Dogs

Great Britain is more famous for its mystery cats (see my previous book, *Mystery Cats of the World*, 1989) than for its mystery dogs, but over the years quite a variety have been reported. Most involve extremely large beasts with Baskervillian overtones (comparable to the controversial Beast of Gevaudan that terrorized France during the mid-eighteenth century), and are often blamed for savage killings of sheep or other livestock. These are surely nothing more unusual than run-wild hounds, or crossbreeds with various of the larger well-established breeds (e.g. mastiff, great dane) in their ancestry. Typical examples reported include an enormous black creature with a howl like a foghorn, hailing from Edale, Derbyshire (*Daily Express*, 14 October 1925); a beast the size of a small pony sighted on Dartmoor by Police Constable John Duckworth in 1969 and again in 1972 (*Sunday Mirror*, 22 October 1972); and a sheep-slaughtering marauder stalking the Welsh hamlet of Clyro, Powys (*Sunday Express*, 10 September 1989) – the locality of the real Baskerville Hall! (Its name was borrowed by Sir Arthur Conan Doyle for his fictional, Dartmoor-sited equivalent.)

Some have opined that these mystery dogs are wolves, but the last verified wolf of mainland Britain died in Scotland in 1743. (Long after the last Irish wolf was killed, in County Carlow around 1786, there were rumours that small wolves existed on the Isle of Achill, just off Ireland's western coast, but these seem to have been wholly mythical.) However, according to Michael Goss (*Fate*, September 1986), when foxes became scarce in a given area, hunters would sometimes release foxes imported from abroad until as recently as the early 1900s, and in some cases it seems that these imported 'foxes' were really jackals or young wolves. A supposed wolf blamed for numerous livestock killings near Monmouthshire's Llanover Park in 1868 was never obtained (*The Field*, 23 May 1868). Conversely, after a long hunt during winter 1904 for an unidentified sheep-killer near Hexham, Northumberland, a wolf *was* finally found – discovered dead, on 29 December 1904, upon a railway line near Carlisle. As John Michell and Robert Rickard discuss in *Living Wonders* (1982), it was initially thought to have been an escapee belonging to a Captain Bains of Shotley Bridge, near Newcastle, which had absconded in October, but his wolf had only been a cub, whereas the dead specimen was fully grown. A visiting American later claimed that the Hexham wolf's head, preserved by a taxidermist, was actually that of a husky-like dog called a malamute, but several experts strenuously denied this. And when the beast responsible for several sheep attacks between Sevenoaks and Tonbridge in 1905 was shot by a gamekeeper on 1 March (*Times*, 2 March 1905), it proved to be a jackal!

In May 1883, R. Payze met some men travelling to London, who had caught three very young, supposed fox cubs while passing through Epping Forest. Payze bought one, naming it Charlie, but as he grew older it became clear that Charlie was not a fox. When shown by Payze to A.D. Bartlett, London Zoo's superintendent, Charlie was readily identified by Bartlett as *Canis latrans*, North America's familiar,

grey-furred coyote or prairie wolf. After receiving Charlie for the zoo, Bartlett investigated his origin, and learnt that a few years earlier four coyote cubs had been brought to England in a ship owned by J.R. Fletcher of the Union Docks. They were kept for a few days at the home of a Colonel Howard of Goldings, Loughton, then taken to Mr Arkwright, formerly Master of the Essex Hunt, and released in Ongar Wood, which joins Epping Forest. Bartlett found that the local people acquainted with this forest well recalled the release of the coyotes, which they termed the 'strange animals from foreign parts' (*The Naturalist's World*, 1884). Charlie was clearly a first-generation offspring of two of these original four; and those, or their descendants, no doubt explained the periodic reports thereafter from this region regarding grey fox-like beasts, occasionally spied yet never caught by the hunt – but how did this strange saga end? Did Epping's coyotes simply die out, or did they establish a thriving lineage? And, if so, could there *still* be coyotes here today?

Intriguingly, in the *Countryman* (summer 1958), Doris W. Metcalf recalled having seen some large, grey-furred wolf-like beasts near Jevington prior to World War II; she had assumed that they must be the last of an ancient line of hill foxes, or perhaps some surviving fox-wolf hybrids (but fox-wolf crossbreeding does not occur, and even if it did, it is highly unlikely that any resulting offspring would be viable). In May

Wolf – identity of Hexham's canine mystery?

1974, a similar animal, said to be 2 ft tall with a distinctly fox-like tail, was spied by Thomas Merrington and others as it slunk around the shores of Hatchmere Lake and the paths in Delamere Forest, Kingsley (*Runcorn Weekly News*, 30 May 1974). When the Isle of Wight's mystifying lion-headed 'Island Monster', allegedly maned but otherwise virtually hairless, was finally shot in 1940, it proved to be an old fox in an advanced state of mange; almost all of its fur had been lost, except for some still covering its neck, creating the illusion of a mane (*Isle of Wight County Press*, 24 February 1940). And a few years ago, Exmoor naturalist Trevor Beer was shown the carcase of a strange grey fox killed at Muddiford; its pelage consisted almost entirely of grey under-fur (hence the fox's odd colour) – due to disease-induced hair loss, or perhaps a mutant gene? Most recently, a peculiar fox-like beast with blue-grey fur was spotted seeking food in a snow-covered field at Cynwyd, Corwen, in North Wales, by farmer Trefor Williams; after capturing it with a lasso, he brought it home. His unexpected find, now known as Samantha, is an Arctic fox *Alopex lagopus*, once again a species not native to Britain (*Daily Post*, 2 February 1990). Back in March 1983, an Arctic fox had been killed at Saltaire, West Yorkshire, by David Bottomley's collie (*Sunday Express*, 6 March). Their origins are unknown.

Amarok and Amphicyonid

The Greenland *amarok* is generally believed to be the Eskimo equivalent of the bugbear, a frightening but wholly fictitious beast employed by parents to scare unruly children. However, as noted by Dr Isaac J. Hayes in *The Land of Desolation* (1871), this is not entirely true, because at least one specimen was actually shot. It proved to have been an enormous wolf, whose skin was later sent to the Copenhagen Museum.

Enormous wolves have also been reported from Alaska and the northernmost reaches of Canada, but these may be something very special. Eye-witnesses have commented that they possess unusually wide heads with surprisingly small ears, extremely thick tails, and rather short legs with splayed feet. Their coats are very long, shaggy, and completely white. What could these most unwolflike wolves be? Zoologist Ivan T. Sanderson felt that the above description compared well with that of a group of supposedly extinct carnivores called amphicyonids or dog-bears. The last American species officially died out 2 million years ago, but in a *Pursuit* article (October 1974) Sanderson postulated that it may have persisted into modern times within the far north of North America, which is rarely entered by people and hence little changed for thousands of years. (Incidentally, in his article Sanderson referred to the amphicyonids as dire wolves, which is incorrect; dire wolves were very large, extinct Pleistocene species directly related to the true, modern-day wolves.)

Andean Wolves, and Cat-like Dogs (or Dog-like Cats?)

The handsome, flame-furred maned wolf *Chrysocyon brachyurus*, readily distinguished by its long, stilt-like legs, is a denizen of the South American pampas, but in 1947 German zoologist Dr Ingo Krumbiegel proposed that a thicker-furred, shorter-limbed, mountain-dwelling equivalent inhabited the Andes, basing his claim upon what had hitherto been classed as an unusually formed maned wolf skull, and an extremely dense pelt bought some years earlier by Lorenz Hagenbeck at a fur market in Buenos Aires that could not be assigned to any type of canid known to science. Krumbiegel formally described this seemingly new species, naming it *Dasycyon hagenbecki* (*Saugetierkundliche Mitteilungen*, 1953). Not long afterwards, however, microscopic examinations of hair samples from this pelt implied that it was merely from some form of domestic sheepdog – but what would today's highly sophisticated DNA hybridization techniques reveal, I wonder?

During his explorations of Bolivia, the lost explorer Colonel Percy Fawcett reported seeing an unidentified dog-like cat called the *mitla*. Jersey Zoo's assistant director Jeremy Mallinson sought it in the early 1960s, but as he describes in *Travels in Search of Endangered Species* (1989), nothing was found. Dr Roy Mackal suspects it to be the bush-dog *Speothos venaticus*, a strange, short-legged species also implicated as the true identity of another allegedly feline mystery beast, known as the pack-hunting Warracaba jaguar of Guyana. However, as discussed in my *Mystery Cats of the World*, for the *mitla* identity I support the candidature of an even stranger species, the little-known small-eared dog or zorro *Atelocynus microtis*, of South America's north-eastern portion, whose most striking attribute is its astonishingly feline gait, totally unlike the less graceful, more boisterous movements of other canine species. In short, it is plausible that the *mitla* is not a dog-like cat at all, but rather a cat-like dog!

Mlularuka – Tanzania's 'Flying Jackal'

No account of canine curiosities could come to a close without mentioning the strange case of Tanzania's *mlularuka* – the 'flying jackal'. As reported by Captain William Hichens (*Discovery*, December 1937), Tanzanian kraalsmen affirmed that this amazing beast, wholly unknown to science, was only too well known to them, as it frequently raided their mango trees and pomegranates during its flights at dusk, and would give voice to loud cries while on the wing. Not surprisingly, their reports were totally disbelieved and dismissed as arrant fantasy – until the 'flying jackal' was discovered!

As I learnt from Dr Maria E. Rutzmoser of Harvard University's Agassiz Museum, in 1926 zoologist Dr Arthur Loveridge was in Tanzania (formerly Tanganyika), collecting specimens for the museum, and at Vituri he succeeded in tracking down the *mlularuka*, but it was not a flying jackal. Instead, it was a large form of gliding rodent.

More specifically, it was a 2½-ft-long scalytail or anomalurid, a

Scalytail – the mystifying 'flying jackal'

peculiar creature with gliding membranes between its limbs so that on first sight it resembles the familiar flying squirrels of Eurasia and North America, but upon closer examination can be readily distinguished via many anatomical differences. Named after the scale-like projections on the underside of the larger species' tails, there are seven recognized species of scalytail, but although well-known in West and Central Africa their existence in East Africa had not previously been suspected. Thus the *mlularuka* was believed at first to be a new species, but was later shown to belong to an already wide-ranging species called Fraser's scalytail *Anomalurus derbianus*, and is referred to as *A. d. orientalis* – a mythical flying jackal that was unmasked as an aerial squirrel-impersonator!

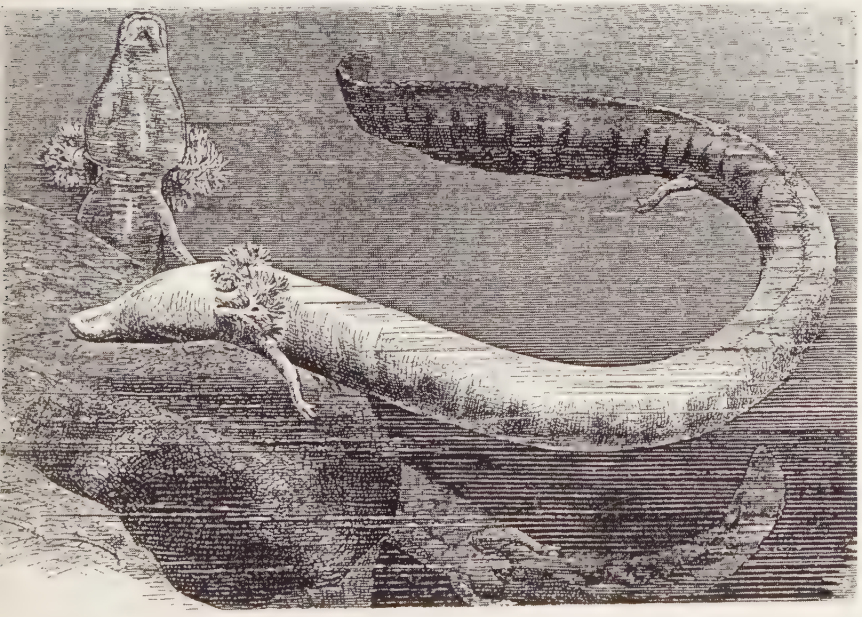
23 *Yugoslavia's Cave-dwelling Dragon-child – The Pallid Proteus or Olm*

> Deep under ground, in subterranean waters, where no ray of light ever penetrates, does the Proteus dwell; light, indeed, is too great a stimulus for the creature to bear.
>
> Charles Knight, *Pictorial Museum of Animated Nature*

Europe is not exactly noted for extraordinary forms of endemic higher animal life. Nonetheless, this general rule does have at least one very estimable exception – an anomalous amphibian once thought to be the offspring of a dragon!

In the 1600s, the intermittent flooding of Yugoslavia's River Bella was attributed by the area's peasants to the activity of a dragon, which supposedly existed inside a nearby mountain and threw wide its lair's

Olm – Yugoslavia's cave-dwelling 'dragon-child'



gates each time rainstorms began filling the lair with water. Moreover, they were actually able to supply some very intriguing evidence for their claim – small, peculiar creatures that only appeared in the river during periods of flooding, and which they resolutely deemed to be dragon infants, washed down from the mountain dragon's nursery.

Each of these putative dragon-children measured approximately 1 ft in total length, with a broad, flat head and narrow snout presenting a sagittiform outline; a very slender, sinuous, eel-like body; four tiny legs; plus an elongate tail, flattened from side to side, bearing a low dorsal fin running along much of its length to its tip.

And reinforcing its already unconventional appearance were three further features of note. Behind its head were three prominent pairs of feathery gills, bright reddish-pink in colour due to the blood continually pumped through them, and rendered additionally conspicuous because the entire remainder of the animal's body was totally without external pigment, so that its head, body, legs, and tail were all ghostly white – so pallid, in fact, that when the creature moved, its blood, flowing through its circulatory system, could be readily perceived as a pale pink tinge coursing beneath its colourless skin's surface. Last, but by no means least, its eyes were apparently useless, as they lay hidden underneath a covering of skin.

Also referred to locally as a 'human fish', this mystifying animal attracted wider notice in 1689, when, as described in his book *Die Ehre des Herzogthumus Crain*, it was discovered by Baron Johann Weichard Valvasor in the underground lake of a spectacular cavern called the Grotto of the Maddalena. Sited in Adelsberg in Carniola, Yugoslavia, this cavern extends many hundreds of feet beneath the earth's surface, so that its lake is enveloped in perpetual blackness. Other subterranean water-filled cavities were later found to contain this creature too; currently, it is known from several underground lakes and streams in north-western Yugoslavia, Istria, Trieste, and southern Austria. There is also an isolated colony in north-eastern Italy.

Following its scientific debut, it was officially christened *Proteus anguinus* by Austrian anatomist Laurenti, and is commonly referred to as the olm, a name coined by Oken. Far from being a baby dragon, the olm was recognized to be a highly novel species of exclusively aquatic salamander, with its highly modified morphology and equally specialized habitat attracting appreciable interest from scientists keen to uncover its lifestyle. Accordingly, it was soon verified that the lightless lakes, pools, and rivers beneath the earth's surface did indeed comprise this strange species' natural domain. Only when floods carry them above-ground into the rivers and streams of the outside world are olms ever seen by the casual observer, and only then for a short time, as their unpigmented skin cannot withstand bright sunlight, so that they rapidly die.

Above-ground, therefore, the olm is virtually helpless, but below-ground it is perfectly adapted for a highly successful spelaean existence. Here, its absence of skin pigment has no detrimental effect. On the contrary, it is a predictable consequence of permanent

cave-dwelling existence – no light ever penetrates the olm's abode, so it has no need of pigment to protect it from sunlight irradiation. Equally, as its world is everlastingly engulfed in darkness, the olm does not need eyes, which is why they have regressed underneath its skin's surface. Nonetheless, as disclosed recently by a French research team (which included veteran olm investigator Dr Jacques Durand), each eye retains an identifiable retina containing some photoreceptive cells. Some dopamine-containing cells also persist – dopamine is involved in light adaptation from darkness – thereby indicating that this cavernicolous creature does still possess a vestigial degree of photosensitivity (*Ophthalmic Research*, 1987).

Even so, it detects its prey – mostly fishes and crustaceans – by responding to the water vibrations that they produce when swimming. Correspondingly, its highly developed degree of sensitivity to water vibrations, coupled with its own eel-like swimming agility, makes it an exceptionally elusive form that can only be netted with difficulty.

One aspect of the olm that invited particular interest and speculation from its early scientific investigators was its superficial similarity to an already-known but commensurately curious amphibian hailing from Mexico – the axolotl. This sturdy, placid creature, nowadays a popular pet worldwide, is the larva of *Ambystoma mexicanum*, the Mexican tiger salamander, and just like the larvae of other salamanders and newts it possesses conspicuous external gills. Yet whereas those other larvae ultimately metamorphose into adults and lose their gills, the axolotl very often fails to metamorphose, remaining in best Peter Pan tradition a juvenile for the whole of its life, and retaining its external gills permanently. However, unlike true larvae, the axolotl is capable of reproduction, so that successive generations of axolotls can arise without ever giving rise to adults. Animals able to reproduce while still in a larval form, i.e. undergoing precocious sexual maturation, are said to be *paedogenetic* or *progenetic*; and the morphological features identifying them as being larvae, e.g. the axolotl's external gills, are termed *neotenic*. (Unfortunately, all too many publications describe animal and features alike as neotenic; instead, the animal is paedogenetic, its features are neotenic.) The factor responsible for the failure of many axolotls to transform into adult salamanders can either be a low concentration of iodine in their pools and streams, or some environmental influence that inhibits their production of the hormone thyroxine.

Being mindful of the axolotl, zoologists considered the possibility that the olm might similarly be a larval form, the juvenile phase in the life-cycle of some larger, mysterious amphibian whose adult stage had yet to be observed by science. Consequently, numerous experiments were undertaken with olms to induce them to metamorphose into this postulated 'missing' adult stage, but none met with success, so that it is now accepted that the obscure olm is not the paedogenetic larva of some other amphibian, but is a genuine species in its own right. In fact, it would seem to be one that echoes the form of the very earliest, most ancient salamanders and newts which were wholly aquatic creatures

American mudpuppy – robust relative of olm

never coming onto land, and possessing external gills, like fishes, throughout their life. The olm's only close, modern-day relatives are the American mudpuppies (*Necturus*), but these are much bulkier, less specialized animals, with well-developed eyes and limbs, and inhabiting shadowy pools and rivers outside caves.

Although science could not induce the olm to metamorphose into a more typically adult form, it has nonetheless succeeded in effecting an equally intriguing transformation. Generally oviparous (but occasionally ovoviviparous), the female olm lays up to forty eggs after mating, and about four months later these hatch. The tiny creatures that emerge are quite different from adult olms in a number of ways. Apart from being much smaller (less than 1 in long), they lack gills and legs, but unexpectedly possess well-developed eyes, and are black in colour. As they grow older, however, their limbs and gills develop, whereas their eyes degenerate and their body pigment disappears – normally. Olm researchers have discovered that if young olms are maintained in well-lit surroundings, unlike their mature parents they do not usually die, because their black body pigment protects them from the effects of the light; moreover, such specimens retain their pigment permanently. Even more interesting, if adult unpigmented olms are exposed to fairly subdued light these too will sometimes survive, because their pale skin will actually initiate pigment production, becoming darker like that of newly hatched specimens.

These findings are of considerable importance, because they show that despite the olm's longstanding, obligatory cave-dwelling existence, its genetic 'blueprint' (genotype) still contains the specific instructions for controlling the manufacture of skin pigment, indicating that under normal conditions their expression is inhibited by those of other genes, but can nonetheless occur *if* suitably stimulated.

As noted at the beginning of this chapter, the olm is undoubtedly one of Europe's most extraordinary creatures; tragically, however, as is so often the fate of the strange and spectacular, these very aspects of its nature have threatened its continuing existence. From being an obscure object of zoological interest only, its fame eventually spread far beyond scientific circles, to the extent that many of its caves (including Adelsberg's Grotto of the Maddalena) are now popular tourist attractions. At one time, its human neighbours profited greatly from this by collecting olms on a grand scale and selling them in jamjars as unusual living souvenirs; predictably, olm numbers plummeted. Happily, however, the Yugoslavian government perceived in time this severe threat to its survival, and drew up stringent laws granting the olm full protection.

Since then, many *Proteus* poachers have been sentenced to terms of imprisonment – a fitting punishment for anyone seeking to desecrate the sightless, subterranean security of these remarkable, grotto-residing dragon-children.

24 *Sign of the Deathshead*

> On the 4th of September [1883] one of these insects flew into a house near the Brunswick Brewery, Leeds. There was a sick child in the house at the time, and the mother, terrified at what she thought an evil omen, could not be pacified for some time. The insect was secured and taken to Wardman's, the bird-stuffer's.
>
> John Grassham, *The Naturalist's World* (January 1884)

Acherontia atropos, the insect referred to above, is nothing if not distinctive in appearance. A rare migrant to the UK, with a wingspan that can exceed 5½ in and a weight that can fall little short of 0.1 oz, it is incontestably Britain's largest species of moth. Its plum-coloured, wavy-lined forewings and rich golden-yellow hindwings, not to mention its bulky body striped boldly underneath in dark brown and primrose bands, also render it one of this country's most attractive moths. Nevertheless, all of these features are eclipsed by a single, but very singular, additional characteristic – one which instantly identifies and distinguishes this species from all others in Britain, which has woven around it a near-indestructible web of folklore and fear, and which has earned it its extremely sinister-sounding English name.

This feature is a strange marking on top of its thorax's front portion which, by a grotesque quirk of nature, forms a surprisingly realistic image of a human skull, ghostly white in colour with black, empty eyesockets. Enhancing this macabre image, the thoracic hairs bearing it are erectile, so that when they are raised up and down while the moth is resting, the 'skull' appears to be nodding!

To many superstition-ridden people in the past (and even to some today) this bizarre insignia is considered to be nothing less than the symbol of Death itself, so that *A. atropos* is commonly referred to as the deathshead, or deathshead hawk moth in full.

As can be imagined, its uncanny skull simulacrum has burdened this perfectly innocent insect with a tearful but wholly undeserved reputation as a harbinger of death, doom, and disaster, and has spawned a rich if ridiculous wealth of fanciful rural beliefs and old wives' tales. For example, on occasions when specimens have been observed in a given region just prior to an outbreak of an epidemic disease, the moths have been automatically blamed, and labelled as the messengers of impending mourning. Indeed, many people blamed the entire French Revolution upon the appearance of an unusual number

Deathshead hawk moth – innocent victim of superstition

of deathshead moths shortly before its commencement. Moreover, this insect is said in some localities to be in league with witches and to murmur into their ears the names of persons soon to be visited by Death. In central France, it is widely believed that blindness will result if dust particles falling from the wings of a deathshead in flight happen to land in the eyes of anyone watching it ... and so on, and so forth.

If these tales were treated lightly, with the humour and contempt that their imaginative but baseless claims deserve, they would constitute nothing more than intriguing yet harmless additions to the annals of modern-day folklore. Tragically, however, for a very long time they have been accepted as truth so wholeheartedly by the credulous and ingenuous that this magnificent moth has been subjected to extensive, barbaric persecution – as illustrated graphically by the Revd J.G. Wood's account in *Illustrated Natural History* of an all too typical incident that he witnessed during the mid-nineteenth century.

> I once saw a whole congregation checked while coming out of church, and assembled in a wide and terrified circle around a poor Death's-head Moth that was quietly making its way across the churchyard-walk. No

> one dared to approach the terrible being, until at last the village blacksmith took heart of grace, and with a long jump, leaped upon the moth, and crushed it beneath his hobnailed feet. I keep the flattened insect in my cabinet, as an example of popular ignorance, and the destructive nature with which such ignorance is always accompanied.

Yet ironically, and despite its eerie thoracic emblem, this much-maligned species was not always so intimately associated in the minds of men with death and ill-fortune. Its first English name, apparently given to it in 1773 by nature writer Wilkes, was much more pleasant-sounding – the jasmine hawk moth, after a favoured food-plant of its caterpillar. In 1775, Moses Harris renamed it the bee tyger hawk moth, because of its brown and yellow stripes. If only he had been content with this. Sadly, however, in 1778 he changed its name again, this time to the deathshead, which, to its great cost, it has retained ever since. Its scientific name is no less ominous either. *Acherontia* is derived from Acheron, a river in Hades, the underworld; and Atropos, eldest of the Fates or Parcae, was the black-veiled goddess responsible for cutting every mortal's Thread of Life.

The tenacity of this species' fallacious notoriety as a winged *memento mori* has even attracted the attention of the film world. In 1967, Tigon Productions released a UK horror movie entitled *The Blood Beast Terror*, which starred Peter Cushing among others, and concerned a Frankensteinian entomologist of the Victorian era who constructs two humans with the ability to transform themselves into giant deathshead moths!

Only a rare spring and summer visitor to Britain, the deathshead occurs widely as a breeding species across all but the most northerly portions of continental Europe, the Azores, and the Mascarenes – but cases of breeding have been reported on occasion from Britain too, with discoveries of caterpillars in several southern counties. Up to 5 in long and of robust girth, the impressive-looking deathshead caterpillar varies from several shades of green to lemon, dark brown, or even purple, and is embellished on each flank by seven mauve or azure chevrons, edged decorously with bright yellow or cream. This bold but beautiful colour scheme is topped off with a hazy sprinkling of deep violet or sparkling white dots, and as a final flourish its body's rear end bears a striking, curved horn.

Pupation takes place underground, the caterpillar digging its way 2–4 in beneath the soil surface and transforming after about a fortnight into a hard, brown, somewhat shiny chrysalis, surrounded by its cocoon of soil, whose function seems to be to maintain the correct degree of humidity around the chrysalis for its successful metamorphosis. By late September or early October, metamorphosis is generally complete and the adult moth emerges. Sometimes two generations can occur in the same year; the second emerges during November.

Whereas the caterpillar thrives upon leaves (especially from the potato), the moth is a fruit-eater primarily – but not exclusively, as beekeepers will verify. Unlike the long, slender proboscis ('tongue') of so many other hawk moths, perfectly designed for probing flowers in search of nectar, the deathshead's is much shorter and stouter, adapted

instead for piercing the tough outer skin of fruit to obtain their succulent juices. However, it is also well-suited as an instrument for puncturing the honey-containing cells in beehives, which has enabled the deathshead to expand its dietary scope, and explains why this attractive species is frequently discovered inside hives. This is exemplified by a startling discovery made in 1901 by the curator of a marine biology station's museum at Rovigno, Istria. As documented by Alfred Bunbury (*The Field*, 7 December 1901):

> On the second floor of a house next to this zoological museum is a window whose wooden persienne have for a long time been closed. Though the shutters have been shut, the old wood was full of chinks, and Dr Hermes, the curator of the museum, noticed that a swarm of bees had utilised the space between the window and the shutters for a hive. Curious to see the work of the bees, on Oct. 1 he climbed up to the window, and was astonished to find it covered with death's head moths (*Acherontia atropos*). The moths, which are extremely fond of honey, had either failed to find their way out of the chinks through which they had entered, or, having fed too heavily on the food, had become dazed in the semi-dark light of the window. Dr Hermes and an assistant made their way into the room by another entrance, and removed a lower pane of the window. Quantities of moths were found hanging on the walls and others on the floor. Many that were dead had evidently been killed by the bees, which had got in under their wings, and those that were still alive were badly mutilated. More than one hundred large specimens were taken that day, and though every day five or six more were found in the same way, by Oct. 13, on which day Dr Hermes was summoned to Berlin, he thought that he had freed the last prisoner. But a few days ago a telegram informed him that 154 moths had again fallen a prey to the bees.

Its liking for honey also appears to explain a characteristic of the deathshead that is every bit as uncanny and superficially unnatural as its thoracic skull sign – namely, it has the highly unexpected and singularly unmoth-like ability to squeak!

Records of this odd behavioural trait date back at least as far as the 1700s, and its physiological basis has incited much speculation. Some researchers assumed that the squeak was created by friction of the moth's abdomen against its thorax at the junction of these two body portions. Certain others suggested that it occurred if the moth's palps (accessory mouthparts) grated upon its proboscis. It is now known to result from the moth's inhalation of air into its pharynx, causing a stiffened flap (the epipharynx) to vibrate very rapidly. In their *Illustrated Encyclopedia of Beekeeping* (1985), Roger Morse and Ted Hooper report that the epipharynx's oscillation yields a pulsed sound of approximately 280 pulses per second for a period of about 80 milliseconds (80 thousandths of one second), followed by a brief pause of 20 milliseconds before the epipharynx is held upwards, enabling the air to be blown out – creating the moth's famous squeak. Lasting a mere 40 milliseconds, it is a very high-pitched sound of about 6 kHz – above the audible range of many humans, though children and acute-eared adults can usually hear it. The moth will perform up to six of these 'squeak-cycles' in as little as one second, but the squeak shortens as the moth tires.

Naturally, there has been much debate about the precise purpose of the deathshead's squeaking. It is certainly a deliberate action, as the moth raises its body when doing so, which enables the sound to be carried to the bees through the air. And as the bees usually react by permitting it to enter the hive unmolested (though its tough cuticle is sufficient to withstand occasional stings imparted by any less trusting hive workers), it would seem that its squeaking serves as an effective password. Indeed, some researchers even assert that the moth's squeak is sufficiently similar to the sound made by the hive's queen bee to fool the workers into believing that their queen is instructing them to remain passive. According to this idea, therefore, the deathshead's squeaking is not so much a password as an inspired voice impression.

Intriguingly, writer and photographer Des Bartlett has discovered that in Kenya the presence of deathshead moths inside the beehives comes as a great shock to many of the native Kikuyu people, who seem convinced that they must be some form of wonderful queen bee (*Animals*, 30 July 1963). Also, their unexpected squeaking has been looked upon by all too many Westerners as something ominous or even preternatural – no doubt inspiring the earlier-mentioned myth that this species whispers into the ears of witches.

All of which brings us back to the subject of superstition, whose anachronistic, irrational utterings of ignorance and fear are still inciting mindless acts of vengeance and violence against this very elegant, showy, and thoroughly harmless insect. Even as we grow ready to greet the ultra-scientific twenty-first century, there are still people who will not hesitate to kill any deathshead hawk moth that they encounter, atavistically recalling foolish fancies from the centuries of the past.

What can we say to such people? Ironically, the best reply is one that was published more than a century ago, but which is still as appropriate today as it was then. To quote from Louis Figuier's *The Insect World* (1872):

> In spite of its ominous livery, the *Atropos* does not come from Hades; it is no envoy of death, bringing sadness and mourning. It does not bring us news of another world; it tells us, on the contrary, that Nature can people every hour; that it was her will to console them for their sadness, to grant to the twilight and to the night the same winged wanderers which are at once the delight and ornament of the hours of light and of day. This is the mission of science, to dissipate the thousands of prejudices and dangerous superstitions which mislead ignorant people.

I pray that its mission will succeed, to ensure the survival of the deathshead hawk moth and every other animal currently endangered by the baneful influence of fatuous notions that should have been buried by rationality and compassion a very long time ago.

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Front jacket illustration shows a frilled lizard in a threatening posture; back jacket illustration shows a dead mystery 'ape' (*Ameranthropoides loysi*) photographed by François de Loys, 1920, in Venezuela/Colombia area of South America (*Fortean Picture Library*). Jacket design by Alison Gadsby.

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